NORTHUMBERLAND

SEA FISHERIES COMMITTEE.

15 NOV. 1903.

REPORT

ON THE

SCIENTIFIC INVESTIGATIONS

For the Year 1900.

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AND

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SUMMARY AND GENERAL REPORT.

I have the honour to present the Report on the scientific investigations, completed or in progress, for the year ending 18th October, 1900.

The results of the trawling excursions show a diminution in the returns for **plaice**. The average catch was only 110, a number below the average for the last five years. There was, as last year, an improvement in size in the latter as compared with the earlier part of the season. **Dabs** continue to improve in numbers, the average this year being 96. From about the end of July to the middle of September there was a great increase in the numbers. The average for the first four completed experiments was 62, and for the last four 130. This species also improved markedly in size during these latter experiments. There was only an average of 4 **turbot**, and this form must therefore be considered to have become very rare close to the coast. The **sole**, on the other hand, with an average of 14, offers a slight improvement over the catches for the last two years.

The **flat fishes** taken together give an average of 231. Last year the average was 220. The improvement is gratifying: but from what has already been pointed out, it is clear that it is due almost entirely to the increase in the numbers of dabs.

A complete statement is given with measurements of all the fishes captured at the first haul on each occasion. The table shows the distribution of fish of different sizes in the several bays along the coast.

As the food of the more important fishes seems to have changed somewhat, the results of the investigations made this year are presented in detail, together with measurements which show that a gradual increase in the size of the generative organs takes place before maturity, and that a considerable increase in size accompanies the ripening of these organs.

Very few **floating eggs** were obtained—only 8 altogether at the excursions, and 9 at Cullercoats. As the nets were used for the most part in the harbour at Cullercoats, the latter number is not surprising. And the explanation of the small number got at the

excursions is that the work was done in the summer, and that the fringe of water near to the coast is also the fringe of the great area of water outside where the spawning and hatching takes place.

A short statement is given of the nature of the **pelagic fauna** obtained with the ova. This forms the subject of a paper by Professor G. S. Brady, based on the collections made at Cullercoats and the excursions for a number of years. These enquiries, including also the contribution by Mr. Bulman on the **Mollusca**, and the accounts by the writer of the shrimp-like **Mysids**, and the curious Crustaceans included under the name **Cumacea** may appear to have a remote connection with our Fisheries. But as these forms contribute to the food of fishes and of crabs and lobsters directly or indirectly, a knowledge of the kinds and of their abundance or scarcity at different places on the coast is essential to a full consideration of the life-histories of the more valuable forms.

A sketch is given of a lecture delivered under the direction of the Technical Education Committee. The opportunity was again taken to interview the fishermen as to the conditions of their calling. It is clear from these **conferences** that the white fishing is now to a large extent in the hands of the trawlers, and that there is consequently great difficulty in providing employment for the last three months of the year. I had the mind to recommend the Committee to grant permits for 6 weeks (from the middle of September to the end of October) trawling with a small trawl of 14—15 feet beam to be worked from a coble. We have reason to believe, however, that our efforts to improve the bait resources of the district will encourage line fishing.

The harbour question at Craster is a very acute one, and the man or men who can solve it will earn the undying gratitude of the fishermen.

The results of the **hatching experiments** made early this year, show that the work of fertilization of the ova of ripe fishes caught by the trawlers must be done at sea soon after the capture of the fishes.

Attention is drawn to the important tables of the catches of **crabs and lobsters** contributed by Mr. Douglas, Beadnell, and Mr. Fawcus, Sea Houses.

An experiment in **mussel cultivation** has been instituted on the Coquet, the result of which will be given, we hope, next year. Other places are suggested, where the conditions appear to offer facilities for increasing the supplies of bait.

The laboratory was utilized this year by Messrs. F. W. Keeble, M.A., and F. W. Gamble, D.Sc., to carry on their interesting and important joint research on the physiology of colour in animals.

Mr. W. T. Gibson, from the Royal College of Science, London, worked in the laboratory during the summer and did a vast amount of general collecting, especially devoting himself to the annelids. Amongst his more important finds was *Synapta digitata*, which I believe is a record for the district. I have to thank him for his help in keeping the faunistic diary.

I beg most gratefully once more to acknowledge the receipt of one guinea each from Messrs. R. Y. Green and G. E. Crawhall. These contributions have helped us in buying "Sars' Crustacea of Norway," a work which has cost over six pounds.

Mr. Bulman has returned to my care the collections of Mollusca, along with a number of boxes and bottles which he put himself to the expense of obtaining when naming and classifying the specimens. For these I beg to thank him. I have unfortunately no room at the laboratory for keeping our collections, and even at the College it is difficult to provide space for them. I hope, however, that the necessity for a collection, either at Cullercoats or in Newcastle, to illustrate our Fisheries will be recognised and provided for. The different temperatures necessary to the comfort of the inhabitants of the tanks and the investigators in the laboratory show also that we want such an extension as will provide a tank-room separate from the work-room.

Alexander Meek.

THE TRAWLING EXCURSIONS.

GENERAL RESULTS.

The kindness of Ald. John Dent, Vice-Chairman of the Northumberland Sea Fisheries Committee, in granting us the use of the "Livingstone," and during the latter part of the season of his new paddle steamer, the "Stanley," has enabled us once more to present the results of a series of trawling excursions. These were made, of course, on the same lines as those of previous years. The weather on the whole this summer was not so favourable, and indeed the season was bad enough to prevent trawling at Goswick Sands and also in Skate Roads. The attempt was made at the latter place on three occasions, and the results will be referred to, but the great mass of weed brought up in the trawl net each time made it impossible to continue the experiment.

The results of the completed experiments are presented in Table I. But before attempting to state what they indicate, I shall give a few general notes on the observations made at each excursion.

Druridge Bay, June 20th.—The first experiment was made here on a very good day. Four hauls were made in a little over seven hours. The fish caught in the first haul are as usual given in detail (see page 16). The 2nd haul was very similar to the first, but there were less small and more large fish, including turbot, brill and sole. One *Cottus quadricornis* and several dead heart-urchins were also included in this catch. The 3rd haul gave very similar results, with a little fucus and dead heart-urchins. The 4th haul furnished in addition to the fishes, a berried-hen crab which was at once returned to the water, and small jelly-fishes (Cyanea and Aurelia). A small plaice was got which was almost entirely covered with pigment on the blind side, but the pigment did not present the characteristic red or yellow spots of the upper side. Another plaice was observed with a large patch of pigment on the lower side, but this time the red spots were present in similar positions to those on the exposed side. A fifth haul was attempted, but the net was launched by mistake inverted: there were no fish.

The fish on the whole were on the small side. No mature plaice had evidently yet come in-shore, as we have especially noted later in the season in former years.

Farnes and Skate Roads, 27th and 28th June.—On the 27th we fished with the lines near the Inner Farne, but only caught one gurnard. The opportunity was taken to obtain surface and bottom material. We made an attempt to trawl in Skate Roads on the 28th, but at the end of the first haul the net was found to be full of sand and weed, and we were therefore obliged to stop the experiment. There were only about a dozen fish, mostly flounders (which were feeding on sand-eels) and there was also one lesser weever.

Alnmouth Bay, June 29th.—Six hauls were made here in about 8 hours. All the hauls were very like the first one which is presented in Table II., but the last haul gave for the most part only small fish. A *Hyas araneus* appeared in the 2nd haul, and during the day numerous *Portunus holsatus*, including many berried females were brought in, along with dead heart-urchins, solen shells, and three specimens of *Loligo media*.

Blyth Bay, July 4th.—About 6½ hours were devoted to this bay. There was a N.E. wind and a strong easterly swell. The first haul of 1 hour 10 minutes besides the fish shown in Table II. included a dead heart-urchin and several *Portunus holsatus*, many of which were berried. On taking hold of this crab, the legs are sometimes thrown off at the breaking joint near to the body. One *Loligo media* was also procured. After being kept in a pail of water for some time, it was put into a bottle containing sea water and formalin added. As usual this brought the chromatophores into view, and it was observed that as they expanded they did so by a series of pulsations. The advancing paralysis of the pigment bearing cells or of the nerves supplying them, culminating in death in the expanded condition thus brought about a sort of tetanic play, which was quite apparent to the naked eye. This Loligo is beautifully transparent when caught, the chromatophores being for the most part in the contracted condition. A similar intensification of colour is seen when Eledone and such Crustacea as *Pandalus annulicornis* are preserved. The 2nd haul included large and small soles, a turbot and a sand-eel. Several Anglers were obtained during the day—one of which presented patches of colour on the ventral —white—side. A greater weever was also caught in the trawl. But the most remarkable feature about the catches was the large number of *Corystes cassivelaunus*.

Blyth Bay, July 11th.—A haul of 20 minutes in the morning gave the following retained fish—soles 3, plaice 29, dab 1, whiting 2, weever 1.

Cambois Bay, July 11th.—The first haul of one hour-and-a-half furnished the catch detailed in Table II. Other two hauls were made—the time given altogether being $4\frac{3}{4}$ hours. The fish caught were remarkable in (1) the large number of young and undersized, (2) the small number of keepable plaice here as compared with the adjoining Blyth Bay, (3) the general large size of the dabs as compared with the latter bay. A sandy ray was included in the catch of the last haul, with a dragonet and a large plaice. The *Portunus holsatus* caught included a few berried females, and one ripe male.

Alnmouth Bay, July 25th.—Four hauls were made in 8 hours, the first one lasting one hour 20 minutes—see Table II. The weather was excellent. The subsequent hauls to the first continued to give small fish in great numbers. Once or twice a great many jelly-fishes were captured. Two *Cottus quadricornis* were obtained; a small lemon dab was included in the last haul; *Portunus holsatus* was as usual fairly plentiful, some berried, some soft. A fair number of the plaice were about medium in size, but these were greatly out-numbered by the smaller sizes.

Druridge Bay, August 1st.—One haul was made here in the afternoon, see Table II., and included many *Portunus holsatus*, a few of which were observed to be soft, some 8 *Corystes cassivelaunus*, and a few *Cyprina islandica*.

Skate Roads, August 6th.—We started early in the morning, and trawled from 7 to 8. There was an easterly swell, showing signs of increasing. Table II. shows that only small fish were caught, and as these were accompanied by a large mass of weed, we were again obliged to stop the experiment in that bay. This haul furnished in addition, 2 small edible crabs, 3 *Cyprina islandica*, *Hyas coarctatus*, and a small dab ($1\frac{1}{4}$ in.)

Druridge Bay, August 6th.—Six hauls were given to this bay, the first haul occupying one hour ten minutes, and the result of this haul is detailed in Table II. The catch other than fish gave still a good deal of weed, including small Galathea, and several *Cyprina islandica*. Four of these latter were opened, and one of them contained the parasitic Malacobdella. Edible crabs were fairly common. A berried *Hyas coarctatus* was also got with a large collection of sponge and zoophyte on her carapace.

Alnmouth Bay, August 14th.—In contrast to the previous week, the weather was now all that could be desired, and the sea perfectly smooth. The fishing was the cleanest we had experienced this year. There was an immense number of *Portunus holsatus*, soft, casting

and berried; together with a few shore crabs, one edible crab and one lesser weever. The first haul was a short one, the net got fast to a piece of wreckage or something of the kind. The second one was also a short one. The third haul was a complete one, and was the one measured. About 8 hours were devoted to the bay althogether.

Blyth Bay, September 5th.—A haul was made in the afternoon of this day in fine weather, being the first trial with the "Stanley." The record is given in Table II. It showed still a large proportion of very small fish.

Dunbridge Bay, September 12th.—Another ideal day favoured us for this experiment. About 8½ hours furnished the total of 311 fish, including for the first time this season, a fair proportion of plaice measuring about or over 20 ins. in length. The dabs were also strikingly large. This day was note-worthy also because a number of turbot of 6 to 10 ins. were got—an unusual size for our trawling grounds—or at any rate for our catches on these grounds. There were also large and small soles. The gurnards, moreover, for the first time this season were freely caught by the line. The fishing was clean on the whole, but towards the end of the day's trawling some weed was picked up, including the usual mass of Amphipods—as pointed out in last year's report. A few anglers and dragonets were obtained during the day. *Portunus holsatus* was caught as is so commonly the case in large numbers. Most of them had evidently been casting, and one berried female was observed. A four-armed common star-fish appeared in one of the hauls.

Skate Roads, September 17th.—Dense fog in the morning prevented fishing at Goswick Sands, but one haul was made at Skate Roads, see Table II. This catch was again accompanied by a great quantity of weed. So there was no help for it, but to leave this bay for this year; and the record for the first haul on this and the Aug. 6th occasion are all we can offer in drawing attention to the results of the experiments.

TABLE I.—Showing the numbers and kinds of fish obtained at each excursion.

PLACE.	DATE.	Turbot.	Brill.	Sole.	Plaice.	Dab.	Lemon Dab.	Flounder.	Whiting.	Mackerel.	Gurnard.	Skate.	Total.	Mid-day Temp. of Surface.	SEA	WIND.
														F.		
Druridge Bay ...	June 20th, 1900	11	1	7	101	52	...	...	...	...	11*a*	...	183	...	Smooth.	N.W.
Alnmouth Bay ...	,, 29th ...	1	1	6	118	81	...	26	1	...	9*b*	...	243	54°	Do.	S.W. rain
Blyth Bay	July 4th ...	1	...	10	193	55	1	1	...	...	...	...	261	54°	Easterly swell.	N.E.
Cambois Bay ...	,, 11th ...	2	1	8	21	59	...	1	...	...	2	1	95	56°	Smooth, but rough later.	S.E.
Alnmouth Bay ...	,, 25th ...	4	...	23	96	180	1	5	2	...	12	...	323	57·5°	Smooth.	W.
Druridge Bay *e* ...	Aug. 6th ...	2	...	23	95	96	...	2	2	...	13	2	235	57°	Easterly swell.	S.E.
Alnmouth Bay ...	,, 14th ...	2	...	19	140	131	...	12	...	1*c*	27*d*	...	332	60°	Smooth.	Calm.
Druridge Bay ...	Sept. 12th ...	6	1	16	120	114	...	1	...	...	53*d*	...	311	57°	Do.	N.W., calm
	Average ..	3·5	0·5	14	110·5	96	...	6	0·5	...	16	0·5	248	56·5°		

a. All caught by trawl. *b*. Only one caught by line. *c*. Caught by line. *d*. Many caught by line.
e. Including 16 plaice, 6 dabs, and 2 soles got at Skate Roads.

The **results** of these experiments this year agree with those of last year in that the catches were better both in quantity and quality towards the end of the summer than at the beginning. A glance at the numbers for Ahmonth Bay and for Dunridge Bay will illustrate this. This is the more curious that such was not observed in previous years. We have certainly noted before that an increase in size had taken place in the latter half of the season. It is about August and September that large mature plaice come into the in-shore waters. They are accompanied by the largest sized dabs we obtain. These fish used to be obtained on well-known smooth areas of ground such as that in the neighbourhood of the Longstone. Fishermen aver that there are so few to be caught on these off-shore grounds that they have given up this particular form of fishing. Trawlers agree likewise in saying that plaice at any rate are much less numerous, not only on the nearer grounds, but even on the more distant banks. General fishery statistics show, in fact, that plaice are really suffering from over-fishing. The numbers we take year after year are fairly constant, and as we have proved are not influenced by our trawling experiments. The average is some 100—150 per day—a very small number indeed. This year the average catch of plaice is 110, which is below that recorded for the past 5 years. These considerations go to show that the larger plaice are migratory, and have to some extent changed their habits, forsaking the grounds they used to frequent for the more in-shore waters, but still evidently in small numbers. Their food is also changed (see page 23), and it is perhaps the fact that the in-shore waters cannot support very many of the larger-sized plaice, and it is this factor which tends to keep the numbers pretty level. Fishermen state that their lines soon fish such places clean, but our experiments show that the power of recuperation is great. We naturally do not have the chance which line fishermen have, of finding the best bits of ground, for it is well-known that even on a smooth area where plaice may be constantly procured, there are limited spots where the fish mostly congregate. It is fair to assume that such spots also present a larger quantity of food than the general ground around them. But though our trawling area is a band of the ground not very broad near to low water mark, the constant increase in size and numbers, week after week, such as we experienced last year, and to a less degree this year could not result from the dispersion of the local plaice over the grounds. They must have been gradually coming in from the deeper waters.

These facts agree with the experience of fishermen. In the past the best catches were got the further out they went, now-a-days, their catches are made closer in-shore.

The dab, on the other hand presents an average this year of 96, as compared with 81 last year, and 77 of the previous year, so that this form is increasing in numbers. The size and appearance were often during the summer all that could be desired. I have been informed by one or two of our line fishermen that the dab was procured in larger numbers during the past season. Like plaice, however, the dabs are not so numerous, nor are they got so large in the earlier part of the season. Their migrations are much more limited, but the general life-history is very similar to that of the plaice. During the spawning season, I have seen some boxes of this species landed from trawlers.

The experiments we have made on the Northumberland coast, and those made by the Scottish Fishery Board and the Devonshire Sea Fisheries Committee (Holt, Stead, &c.*) show that the dominant species of the in-shore waters all round the coast is the plaice. Before the immense development in the fishing industry took place, this species was able easily to hold its own in these in-shore waters, but there were present evidently large numbers of the sub-dominant dab, and the more isolated turbot, brill and sole. The gurnard among round fishes is still very numerous, and with it even in the summer a quantity of whitings, haddocks, and codlings used to be found. The change which has been taking place may be said to be then—a diminution in the numbers of all these forms, except the dab has occurred. This has affected, first, the (at least now-a-days) more characteristically isolated turbot and sole: secondly, the very gregarious haddock and cod; and now evidently also the dominant species, the plaice. The haddock still comes to the coast in the winter, but instead of the migration occurring during the last three months of the year, it appears to take place principally about the beginning of the year—at a time when such a migration may well be assumed to be opposed to our knowledge of the spawning habits of these fishes. The dominant species is decreasing, and the sub-dominant species is increasing in numbers. It is possible that the latter may become dominant if the conditions should continue to prove unfavourable for the plaice. We can view with a degree of equanimity from the point of view of the breakfast table

* 1898, *Jour. Mar. Biol. Assn.* New Series, vol. V., No. 3, page 296.

this battle for priority between the dab and the plaice, since the former is usually considered rather better than the latter. But the large size of the plaice, and its wide distribution over the North Sea, in contrast to the small size and limited coastal distribution of the dab, give the outlook a grave colour, for if the plaice lose its dominant place in-shore where the first years of its life are spent, it must be due to the fact that the fish is becoming scarce in the North Sea, as a whole.

Turbot present the small average this year of 4, which is below that of most of the years. Not so very many years ago turbot were plentiful, especially during the herring season; the in-shore fishermen get very few now-a-days, but the Shields trawlers procure pretty good catches. There is no doubt, however, as we pointed out last year that the turbot must now be looked upon as a rare fish in-shore, where it used to be obtained in large numbers.

Four brill were captured during the season. We never get many brill, but the Shields trawlers capture about 15 to 18 tons a year. I do not suppose it was at any time common in-shore.

The sole this year averaged 14, an increase on the catches for the last two years. It is satisfactory that this fish has been able to recover its position to some extent in-shore, but it is almost as rare as it is valuable.

Flounders averaged 6 this year, a number which is about equal to the average of previous years.

The average catch of flat fish for this season was 231, as compared with 220 for last year. It is the highest average yet recorded, but the increase is due to the large catches of dabs. Plaice, as we have noted, have diminished in numbers. Nevertheless, the increase in the catches of flat fishes is well worth noting. These are the forms which, with the gurnards, almost exclusively inhabit the smooth areas along the coast. At the present time, with the exception of the plaice, these flat fishes occur in these places in both immature and mature condition. They pass the first years of their existence close in-shore, and return to some extent after spawning. The protection afforded them evidently amply justifies the continuation of the restriction imposed upon trawlers. We ought to remember, however, that nearly all the fishes when they become mature leave the in-shore waters for the unrestricted fishing grounds in deeper water at the spawning season, so that after all the restriction benefits the trawler more than the line fisherman. We cannot help reflecting, therefore, that the restriction does not convey

the benefit intended to the older class of fishermen. My last year's report, and further evidence conveyed in this one, show that the white fishing is now practically in the hands of the trawlers. There are one or two favoured in-shore places where the fishes still tend to congregate during the general migration to the coast in the winter, curiously enough, however, some months later evidently than was the rule up to a few years ago; but no one will doubt the serious general diminution of fishes along the coast which has had such a detrimental effect on line fishing, and the condition of certain of the fishing villages. Were it not for other kinds of fishing upon which for the most part the trawler can exercise no competitive or harmful effect, or at all events a harmful effect which has never yet been clearly proved, fishing from the villages along the coast would have long before now been at an end.

The following summary of the statistics gathered by the Fishery Officers for a few recent years illustrate this:—

WHITE FISH.

NORTHERN DISTRICT.

1895. Tons Cwts.	£	1896. Tons. Cwts.	£	1897. Tons. Cwts.	£	1898. Tons Cwts.	£
1,399 9	?	1,135 14	10,623	701 11	7,577	457 14	5,279

SOUTHERN DISTRICT.

(EXCLUDING NORTH SHIELDS).

1,271 15	16,740	1,185 13	13,795	657 15	7,735	603 19	6,574

NORTH SHIELDS.

9,213 10	139,430	7,515 13	122,526	8,212 15	139,742	9,106 5	140,815

It is of course true that the decline shown by the figures in the in-shore line fishing is to some extent brought about by the smaller number of boats which have each year prosecuted this branch of the fishing industry. But the very fact that such a diminution has occurred in the number of boats and the number of men employed serves still further to demonstrate that the decrease indicated is not apparent, but actual.

If these numbers show that the conditions of the white fishing, as far as the line fishermen are concerned, are getting worse than better, a most interesting and careful analysis of the statistics relating to trawl fishing with especial reference to the North Sea by Mr. Walter Garstang* indicates that the average catches of trawlers

*The Impoverishment of the Sea. A critical summary of the Experimental and Statistical Evidence bearing upon the Alleged Depletion of the Trawling Grounds. *Journal of the Marine Biological Association of the United Kingdom*, vol. vi., No. 1, July, 1900, pp. 1—69.

are also gradually declining year by year. This bears out what certain owners of trawlers have said to me, but I have been endeavouring to get such statements in a statistical form.

The evidence then is all pointing to the conclusion that there is not only a danger of over fishing, but that the effects are already becoming felt. The North Sea, large area as it is, with immense facilities for the breeding and rearing of the food fishes, seems not to be able to cope with the in-roads which are now-a-days constantly made upon it by fishermen. And it is therefore the duty of Government and the Sea Fisheries Committees to do all they can to learn the actual facts, or as many of the facts as possible, and to stimulate the enquiries which are being made into the life-histories and conditions of life of the species affected, so that if the above conclusion is found to be true, a grave problem may be faced with as perfect a knowledge as we can obtain.

COMPLETE RECORDS WITH SIZES OF ALL THE FISHES OBTAINED IN THE FIRST HAUL.

In Table II are presented the results of the measurements of all the fishes captured in the first haul at each excursion. In some cases only one haul was made; but at ordinary excursions we have as last year devoted the first haul to this careful analysis, with the exception already pointed out (page 9).

The Table deserves careful consideration. It shows the kind of fishes and the sizes which are apparently most common in these bays. We may take it for granted that most of the larger fishes which come in the way of the trawl are captured, and when the "cod end" receives a fair share of these, the smaller ones will be more likely to be retained likewise. We seldom, or never, get any fish less than four inches in length, and below that size, therefore, it is possible that a number of these species frequent even the depths in which we experiment. For the most part, however, the smaller and younger fishes appear to get their sustenance closer inshore.

TABLE II.—Complete Record, with sizes, of all fish obtained at the first haul.

A. DRURIDGE BAY, June 20th (1 hour 10 minutes).

	INCHES.																Total.
	4	5	6	7	8	9	10	11	12	13	14	15	16	17	13	19	20	
Plaice ...	6	5	14	15	9	...	...	4	5	5	1	6	1	1	...	...	...	72
Dab ...	1	...	5	...	4	2	4	...	...	...	1	...	...	...	...	...	...	17
Turbot ...	...	...	...	...	...	...	...	...	2	...	...	1	...	...	...	...	...	3
Sole ...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1
Flounder...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	1
Gurnard ...	...	...	2	5	3	2	3	1	...	...	...	...	...	...	...	...	...	16
Angler ...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	1	2
																		112

ALNMOUTH BAY, June 29th (1 hour 10 minutes).

Plaice ...	...	6	10	18	17	10	1	9	3	2	6	...	2	...	...	...	...	84
Dab ...	...	...	2	16	7	6	5	2	...	...	...	...	..	...	...	...	...	38
Sole ...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	1
Flounder...	...	2	1	9	16	5	1	...	...	...	...	...	...	...	...	...	...	34
Whiting ...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Gurnard ...	1	1	8	15	7	1	...	1	...	...	...	...	...	...	...	...	...	34
Angler ...	...	...	...	...	1	...	...	...	...	...	...	1	...	1	...	...	22 in. 1	4
																		196

BLYTH BAY, July 4th (1 hour 10 minntes).

	INCHES.																Total.
	4	4	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Plaice ...	4	7	5	7	12	5	7	7	3	2	...	...	...	...	...	...	...	59
Dab ..	1	2	...	3	7	6	1	1	1	1	...	...	...	...	...	...	...	23
Flounder...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	1
Angler ...	...	...	...	...	...	...	...	1	...	...	...	1	...	...	1	...	...	3
Weever * ...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Dragonet **	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	1
																		88

* 6½ inches—The Greater Weever.
** 8½ inches.

CAMBOIS BAY, July 11th (1½ hours).

Plaice ...	...	5	5	9	3	1	...	...	1	...	...	..	...	...	...	...	...	27
Dab ...	...	8	17	28	19	5	3	...	...	...	...	...	...	...	...	...	...	80
Brill ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1
Turbot ...	...	...	...	...	...	..	...	...	...	1	...	...	...	...	...	...	1	2
Sole ...	...	...	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...	2
Flounder...	...	...	5	8	13	2	...	...	...	...	...	...	...	...	...	...	...	28
Gurnard ...	16	8	11	6	2	...	...	...	...	...	...	...	...	...	...	...	...	13
Cottus quadricornis	...	2	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	2
																		185

ALNMOUTH BAY, 25th July (1 hour 20 minutes).

	INCHES.																Total.
	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Plaice ..	...	5	4	6	9	13	6	1	2	1	...	1	...	1	...	...	...	49
Dab ...	7	5	4	7	4	7	6	2	...	...	...	...	...	...	...	...	...	42
																	22 in.	
Turbot ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1
Sole ...	...	...	...	...	...	...	...	...	...	1	1	...	...	...	...	...	1	3
Flounder..	...	5	5	12	14	12	3	...	...	...	...	...	...	...	...	...	...	51
Gurnard ..	10	12	35	58	11	...	...	...	...	1	1	...	...	...	...	...	...	128
Whiting ...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1
Angler ...	...	...	...	...	3	1	3	...	...	...	...	...	...	...	...	...	...	7
																		282

DRURIDGE BAY, 1st August (1 hour).

																	22 in.	
Plaice ..	2	15	4	11	7	5	4	5	3	8	4	7	3	...	...	...	1	79
Dab ...	2	3	...	7	11	15	9	5	...	...	...	...	...	...	...	...	...	52
Turbot ...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Sole ...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	...	...	...	2
Gurnard ..	4	12	13	24	13	16	5	1	1	...	2	...	1	...	...	...	...	92
Whiting ..	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Cole Fish	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
																		228

SKATE ROADS, 6th August, 1900 (1 hour).

	INCHES.																Total.
	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Plaice ...	1	13	24	46	38	12	2	1	1	...	...	...	...	...	...	...	...	138
Dab ...	1	1	...	2	3	2	...	1	...	...	...	...	...	...	...	...	...	10
Sole ...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	1	...	2
Flounder...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1
Gurnard ...	...	2	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	3
Angler ...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	1
Sandy Ray	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	1	...	2
																		157

DRURIDGE BAY, 6th August, 1900 (1 hour 10 minutes).

Plaice ...	...	11	4	1	10	12	10	1	4	1	3	..	...	...	...	...	...	57
Dab ...	1	1	3	3	3	1	5	1	1	...	...	...	...	...	...	...	...	19
Sole ..	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	...	2
Flounder...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	1
Turbot ...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	1
Gurnard ..	...	1	...	1	1	...	...	1	...	...	...	1	...	...	1	...	...	6
																		86

ALNMOUTH BAY, 14th August, 1900 (1 hour 10 minutes).

	INCHES.																Total.
	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Plaice ...	1	1	18	6	11	12	9	4	4	3	3	3	2	...	...	...	...	77
Dab ...	6	22	3	1	4	7	6	5	2	1	...	...	...	...	...	...	...	57
Sole ...	...	...	...	...	1	1	...	...	1	1	...	1	...	...	...	...	...	5
Turbot ...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	1
Flounder...	...	...	3	7	11	14	4	1	...	...	...	...	...	...	...	...	...	40
Gurnard ...	10	8	10	55	23	11	2	1	1	1	...	1	...	...	...	...	...	123
Angler ...	...	...	...	...	...	...	...	...	...	4	...	...	...	...	...	.	...	4
																		307

BLYTH BAY, 5th September, 1900, ($\frac{1}{2}$ hour).

Plaice ...	...	3	18	11	3	9	4	2	...	1	1	...	...	...	...	...	..	52
Dab ...	4	11	5	7	6	6	1	...	1	...	...	...	...	...	...	...	...	41
Sole ..	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	1
Flounder...	...	...	...	2	2	...	1	...	...	...	...	...	...	...	...	...	...	5
Turbot ...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	1
Gurnard ...	3	15	2	4	1	...	...	...	..	...	...	...	...	...	...	...	...	25
Whiting ...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	1
Weever ...	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	2
Dragonet...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Cottus quadricornis	...	1	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1

DRURIDGE BAY, 12th September, 1900 (1 hour 5 minutes).

	INCHES.																Total.
	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Plaice ...	...	...	1	1	4	10	5	14	6	6	1	1	...	...	...	1	...	50
Dab ...	4	24	7	2	5	13	8	7	1	...	1	...	...	...	...	...	...	72
Sole ...	...	...	...	...	...	1	1	...	1	1	3	...	1	...	...	...	...	8
Gurnard ...	1	7	10	9	5	5	...	...	...	2	2	...	...	...	...	...	...	41
Angler ...	...	...	...	...	...	2	...	...	...	...	...	...	1	...	...	...	...	3
Dragonet...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	1
																		175

SKATE ROADS, 17th September, 1900 (1 hour).

Plaice ...	1	11	18	10	24	8	2	2	2	1	...	...	...	...	...	...	...	79
Dab ...	...	6	6	...	...	1	2	...	...	...	...	1	2	...	...	...	...	18
Brill ...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	..	...	...	1
Turbot ...	...	...	1	...	...	1	1	...	...	...	...	...	...	...	...	...	...	3
Gurnard ...	1	2	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4
Sandy Ray	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
																		175

The different bays differ greatly in the proportion of small and large fish. At Almouth Bay and Druridge Bay much larger representatives of the common species were got than at Blyth Bay and Cambois Bay. A reference to the corresponding table in last year's report will show that while the former bays furnished, as this year, a fair number of large fish, Cambois Bay gave equally good results, and Skate Roads was not very far behind. We have already noted that the conditions in Skate Roads precluded trawling this year, and the catches registered in Table II. for the first and only haul made there, show that the quality of the fishes was much below the average. On a clean bottom, as a rule, the fishes may be caught by the trawl in the numbers shown in our tables each year, but the conditions which heap up weed in the bays evidently compel the fishes to hide or to migrate further out.

The same bay at different times may present great differences in regard to the proportion of sizes of the same species, and the relative proportion in number of the various species. Naturally, also, we get different representatives of the more isolated wanderers into these bays at such successive visits. But a variation in this respect from the dominant and sub-dominant forms would be produced, for instance, by the trawl getting nearer the rocks than usual, and catching some of the species which occur more exclusively in such places.

As has been pointed out in previous reports, the plaice are with few exceptions immature fish. The condition of the bays in this respect may be better illustrated by presenting the total number of plaice and dabs registered in these tables for the last two years.

PLAICE.

Inches.

	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	2
1899	...	19	86	78	71	44	47	47	36	35	26	14	1	1	...	1	...	...	
1900	15	82	125	141	147	100	50	50	34	30	19	18	8	2	...	1	...	...	
Total	15	101	211	219	218	144	97	97	70	65	45	32	9	3	...	2	...	...	

DABS.

1899	1	10	29	166	149	65	35	12	2	7	2	1	...	...	...	...	...	...	
1900	27	83	52	76	73	72	50	24	6	2	2	1	2	...	...	...	...	...	
Total	28	93	81	242	222	137	85	36	8	9	4	2	2	...	...	...	...	...	

Last year 10 hauls and this year 12 hauls were recorded, and the above numbers give the total results for plaice and dabs.

In 1899, there were say 1—2 mature plaice, and over 500 immature caught at the first haul. This year there were 2—4 mature and over 800 immature.

As regards the dab, drawing the line at 7 inches—the size Holt gives, for I find it difficult to indicate the ripeness of this form with the specimens we obtain (see table III., page 28)—we find 206 immature and 273 mature for the year 1899, and 238 immature and 232 mature for 1900.

The plaice then is not so very much more numerous than the dab in these bays. It is clearly dominant above 10 inches, but from 7—9 inches there appear to be more dabs, and again from 5—6 inches more plaice.

The fact that measurements are recorded in every inch shows the variation in size met with in these fishes, and that it is impossible to give an absolute size for the yearly stages in growth. This is due, of course, not alone to individual variation and other factors influencing the rate of growth, but to the extended period of spawning. The larger numbers, however, indicate the average measurements at these stages.

THE SIZE, FOOD, SEX, AND DEGREE OF MATURITY.

The results of the measurements and observations made as to the food, &c., of certain of the fishes captured are presented in tabular form.

Plaice.—The plaice had almost exclusively a mollusean diet when I began to make the observations. The common form fed upon was *Donax trunculus*, and *Tellina tenuis* was often procured likewise. During the last year or two the former species has evidently not been so common, and annelids have been used instead, or in preference, and occasionally small amphipods.

It will be seen that the only distinctly mature plaice obtained were 20 inches in length. Even at 16 and 17 inches, the ovaries presented no opaque ova such as could be observed by the eye or

with a magnifying lens. The size of the ovary is greatly increased at maturity. The measurements are given in extreme length. The testis was measured likewise along the greatest length. It is much smaller naturally than the ovary, but as is well known to those who have seen a basket of plaice during the spawning season, or who have had artificially to fertilize the ova of this species, a male plaice gives a good supply of milt.

Dab.—Dabs used to feed to a large extent on *Tortunus holsatus*, along with a varied molluscan diet. Their diet is still much the same, but the mollusca only include *Solen siliqua* and the forms mentioned as forming the food of the plaice.

As was mentioned in the last section, the female dab does not exhibit maturing ova in many of the examples we have examined at sizes which ought to present this condition. This was the case, for instance, at 10 and even at 12 inches. But Holt, who made a careful analysis of this and other species at Grimsby, concluded that the dab matured at about 7 inches. The specimens we examined seemed for the most part to have recently spawned, and thus the ovary would appear smaller, and would contain ova in a quite immature condition. The ripe testis seems to be relatively large in the dabs.

Turbot.—The turbot still feeds in these bays, as far as our observations show, entirely on the smaller fish as sand-eels, whitings, weevers. In regard to the measurements of the generative organs, these were made from the opening to the dorsal projection, and a horizontal measurement along the horizontal lobe was also made. These usually proved to be approximately equal, and when not equal, the average measurement is given.

Brill.—The brill is similar to the turbot in its choice of food.

Sole—As usual this year very little food was seen in the stomachs of the soles. As regards the size of the generative organs, the marked contrast in size between the testis and ovary is very striking. The ripe ovary measured some 6—8 inches while the testis was only $\frac{1}{4}-\frac{1}{2}$ inch in length. The small size of the testis from a technical point of view, practically bars the way to successfully artificially fertilizing the ova of soles. Were it possible to deal with the sole as with the plaice and the round fishes, most people would agree that a hatchery would be of great benefit.

TABLE III.—PLAICE.

DATE.	SIZE.	SEX.	MATURE OR IMMATURE.	Size of Gen. Organ	FOOD.	REMARKS.
	INCHES.			INCHES.		
June 20th ...	13 × 7¼	Male	—	⅜	Tellina tenuis	
(Druridge)	15 × 8½	Female	—	1¾	Empty...	
	17 × 10	Female	—	2¼	Donax trunculus	No ova visible
June 29th ...	13¼ × 8¼	Male		⅜	Tellina tenuis	
(Ahmouth)	14 × 8½	Male	—	½	,, ...	½-in. but much thicker than
	15⅓ × 9½	Female	—	2	,, ...	previous one
July 11th ...	14¼ × 9	Female	—	1½	,, ...	
(Cambois)	12⅛ × 7	Female	—	1⅝	,, ...	
	9¾ × 5½	Female	—	1	Annelid	
July 25th ...	16½ × 10	Female	—	2¼	Young Solen and Annelid	No ova visible
Ahmouth	14 × 8¾	Male		⅝	Small pieces of Solen	
	10¼ × 6½	Female	—		,, ...	Could not be measured
August 14th ..	15½ × 9¼	Female	—	1½	Annelid	No ova visible
(Ahmouth)	12½ × 7½	Female	—	1½	Empty	,,
	10½ × 6¼	Male		⅝	Nemertean	
September 5th	13⅓ × 8	Male	—	¾	Small bit of Solen	
Blyth)	11⅔ × 6¾	Male		⅝	Annelid tubes (Terebella) with Amphipods ..	
	11¼ × 6½	Male	—	½	Empty...	
September 22nd	20 × 11½	Female	Mature	—	Donax trunculus	Ova opaque numerous
(Druridge)	21¼ × 12¼	Female	,,	6¼	,, ...	,,
	14½ × 8⅓	Male		⅝	Empty...	

DATE.	SIZE.	SEX.	MATURE OR IMMATURE.	Size of Gen. Organ	FOOD.	REMARKS.
June 20th ...	14	Female	+	2¼	Animal tissue	
(Druridge)	12¼	Female	+	1¾	Common shrimps	
June 29th ...	12½	Female	+	3	Common shrimps	
(Alnmouth)	11¼	Female		1¾	Dab (some 4-in.)	
	10½	Female		1½	Common shrimps	
July 11th ...	13½	Female	+	2½	Empty...	
(Cambois)						
July 25th ...	15	Female	+	3 ?	Unrecognizable fish	
(Alnmouth)	15½	Female	+	3	4 Portunus holsatus	
September 22nd	15	Female	+		Empty...	
(Druridge)						

Table III.—Continued. SOLE.

Date.	Size.	Sex.	Mature or Immature.	Size of Gen. Organ	Food.	Remarks.
June 20th ...	16 × 7	Male	+	½	Empty...	
(Druridge)	13½ × 5½	Female		3½ av'age	,, ...	
	9¾ × 4	Female		2	Annelid	
June 29th ...	12½ × 5	Male		¼	Empty...	
(Almmouth)	13 × 5	Female		3¼	,, ...	
	10¾ × 4¾	Female		3	Annelids	
July 11th ...	16¼ × 7	Female	+	7½	Empty...	(Blyth Bay)
(Cambois)	14 × 6¼	Female	+	3½	Animal tissue	
	10 × 4¼	Female		2	Empty...	
July 25th ...	19½ × 8¼	Female	+	8¾	,, ...	*Ripe—ova opaque numerous
(Almmouth)	19 × 8⅛	Female	+	8¾	,, ...	,,
	12¾ × 5½	Female	+	4¼	,, ...	,,
August 14th ...	15½ × 7	Female	+	8	Empty...	Ripe
(Almmouth)	12¼ × 5¼	Female	+	2½	,, ...	A few opaque ova visible
	10 × 4	Female		1⅝	,, ...	Immature
September 5th	18 × 7½	Female	+	4½	,, ...	Mature
(Blyth)	18 × 8½	Female	+	6	,, ...	,,
September 22nd	16½ × 6¾	Female	+	8	,, ...	
(Druridge)	12½ × 5½	Female		4	,, ...	

DATE.	SIZE.	SEX.	MATURE OR IMMATURE.	Size of Gen. Organ	FOOD.	REMARKS.
	INCHES.			INCHES.		
June 20th ...	$13\frac{3}{4} \times 7\frac{3}{4}$	Female	+	$2\frac{1}{2}$	One small Tellina tenuis...	Spawned
(Druridge)	$10\frac{1}{2} \times 6$	Female	+	$1\frac{1}{4}$	Empty...	,,
	$9\frac{1}{2} \times 5$	Female	+	2	Amphipods—small, and small Tellina ..	,,
June 29th ..	$12\frac{1}{4} \times 6\frac{1}{2}$	Female	+	$1\frac{3}{4}$	Annelid	
(Alnmouth)	$11\frac{1}{2} \times 6\frac{1}{4}$	Female	+	$1\frac{1}{2}$	Portion of Portunus holsatus	
	$9 \times 4\frac{1}{2}$	Female		$\frac{3}{4}$	Annelid and Tellina tenuis	
July 11th ...	$14\frac{1}{2} \times 8\frac{1}{2}$	Female	+	3	Portunus holsatus	Spawned
(Cambois)	$11\frac{1}{4} \times 6\frac{1}{2}$	Male	+	$1\frac{1}{4}$	Small amphipods	Ripe milt
	$9\frac{3}{4} \times 5\frac{1}{2}$	Male		$\frac{3}{4}$	,, ...	
July 25th ..	$12\frac{1}{4} \times 7$	Female	+?	$1\frac{3}{8}$	Portunus holsatus	No ova visible
(Alnmouth)	$10 \times 5\frac{1}{4}$	Female	+	$1\frac{1}{2}$	Empty...	Ovary much thinner than last
	9×5	Female		$1\frac{1}{4}$	,, ...	
August 14th ...	13×7	Female	+	$2\frac{3}{4}$	Empty...	
(Alnmouth)	$10\frac{1}{4} \times 5\frac{3}{4}$	Female	+?	$\frac{7}{8}$	,, ...	No ova visible
	$9 \times 4\frac{1}{2}$	Female	+?	$\frac{7}{8}$	,, ...	,,
September 5th (Blyth)	$11\frac{1}{2} \times 6\frac{1}{4}$	Female	+	1	Portunus holsatus	
September 22nd	13×7	Female	+	$1\frac{3}{4}$	Amphipods with broken shells	
(Druridge)	$10\frac{1}{4} \times 5\frac{1}{2}$	Female	+	2	,, ...	
	$8\frac{3}{4} \times 4\frac{1}{2}$	Female	+	$1\frac{1}{2}$	,, ...	

TABLE III.—CONTINUED. TURBOT.

DATE.	SIZE.	SEX.	MATURE OR IMMATURE.	Size of Gen. Organ	FOOD.	REMARKS.
	INCHES.			INCHES.		
June 20th ... (Druridge)	15½ × 12	Male		1½	Empty...	
	17 × 12½	Male		2	,, ...	
	13¾ × 11	Male		1⅜	,, ...	
	16 × 13	Female		2½	,, ...	
June 29th ... (Almouth)	14 × 11	Male		1½	Sand-eel	
July 11th ... (Cambois)	13 × 10	Female	+	1½	,, (?) Much digested	
July 25th ... (Almouth)	21¾ × 17	Female	+	1⅝	Empty	Spawned
	15⅛ × 12¼	Female	+	2¼	,, ...	,,
August 14th ... (Almouth)	12½ × 9¼	Female	Immature	1	Much digested fish, perhaps small whiting	No ova visible
September 5th (Blyth)	9½ × 7	Female		1½	Empty...	Spawned
	15 × 11	Female		2	Sand eels	
September 22nd (Druridge)	15 × 11½	Female	—	1⅝	Much digested sand-eels	No ova visible
	15 × 11¼	Female	—	1½	Sand-eel	,,

TABLE III.—CONTINUED. BRILL.

DATE.	SIZE.	SEX.	MATURE OR IMMATURE.	Size of Gen.Organ	FOOD.	REMARKS.
June 29th ... (Alnmouth)	15 × $8\frac{1}{2}$	Female	+	$1\frac{1}{2}$	Sand-eel	
July 11th ... (Cambois)	$19\frac{1}{4} \times 12\frac{1}{2}$	Female	+	$4\frac{1}{2}$	Empty...	

TABLE III.—CONTINUED. FLOUNDER.

DATE.	SIZE.	SEX.	MATURE OR IMMATURE.	Size of Gen.Organ	FOOD.	REMARKS.
June 29th ... (Alnmouth)	13 × $7\frac{1}{2}$	Female		$2\frac{1}{4}$	Annelid	
	$10\frac{3}{4} \times 5\frac{3}{4}$	Male		$\frac{1}{4}$	Empty...	

PELAGIC OVA.

Very few ova were captured this year in the surface and mid-water nets, at the excursions.

June 27—Holy Island Harbour ...	Five-Bearded Rockling ...	3
,, 29—Almmouth Bay	no ova.	
July 4—Blyth Bay...	*Callionymus lyra*	1
	Five-bearded Rockling ...	1
	Common Dab	1
July 25—Almmouth Bay	*Callionymus lyra*	1
Aag. 6—Druridge Bay	Flounder	1

At Cullercoats, principally in the harbour, the following ova were obtained:—

May 22—Cod	1	
,, 24—Brill	3	(see last year's report.)
	(in bottom net).	
May 29—Gurnard	1	(mid-water.)
June 26—Dragonet	2	
July 14— ,, ...	1	
Brill	1	

The number of fish ova we obtain each year is thus liable to a great deal of variation. During certain of the seasons, we have obtained comparatively large numbers, and during others as this one very few. The reason is that the nets are used on the fringe of the large area in which the ova are placed, and the prevailing winds and other circumstances which would alter the currents determine the number of the ova which will arrive before hatching in our inshore waters.

A DEMERSAL OVUM.

Mr. Hastings brought to me on the 27th March a small group of interesting demersal ova from 40—50 fathoms, 120 miles E.N.E. off the Tyne. They were placed in a cavity of a small stone. The ova measured on the average 1·87 mm. Each was enclosed in a thick (0·1125 mm.) very tough and strong capsule; the yolk sac was light orange yellow in colour; there was a large oil globule (0·5 mm.) The contained embryo was pigmented with yellow and black chromatophores, the eyes being very deeply coloured with

black pigment. The two kinds of pigment appeared to give rise to three bands in the caudal region. One of the embryos was found hatched on the morning of the 3rd April, and other two next day. They were very lively, light green in general appearance, with prominent eyes. They measured about 7·5 mm.

A closer inspection showed that the black pigment was distributed in two longitudinal lateral rows on each side of the dorsal and ventral fins; and that the yellow pigment was dotted all over the animal. There were concentrations of both kinds on the head, and also in positions which seemed to mark 2 dorsal and 2 ventral (anal) fins.

I beg to thank Mr. E. W. L. Holt for kindly replying to my enquiry that the eggs are probably those of *Agonus cataphractus* (the armed bull-head). They certainly agree pretty closely with the measurements and descriptions recorded for this species, but I did not observe the irregularities of the capsule which are said to be characteristic.

PLANKTON.

The other pelagic life observed in the gatherings made at the trawling excursions, included the forms previously pointed out—see also Dr. Brady's paper (page 64). During June Medusoids were very common especially *Sarsia tubulosa* and *Phialidium variabile*. We got also Pleurobrachia, Lesueuria and Beroë in much smaller numbers. We always got these forms, but the *Sarsia* this year appeared to be very much more numerous than usual.

Still more remarkable, however, were the immense catches of practically nothing else but Cladocera, and these mainly, if not purely, *Evadne nordmanni* and *Pleopis polyphemoides*. This was the case at Blyth Bay, 4th July, and at Cambois Bay, 11th July, but in other places the predominance of Copepoda was usually maintained. During the season the usual succession of larval forms appeared, and jelly-fishes were fairly common.

MEETINGS WITH FISHERMEN AND A SUMMARY

OF A

LECTURE ON "OUR SEA FISHERIES."

Apart from the informal meetings at Cullercoats, North Shields, and elsewhere on the coast, the delivery of a lecture on "Our Sea Fisheries" afforded an opportunity of again discussing with the men the questions affecting them.

The lecture gave a *resumé* of the history of fisheries on the coast, and a review of the conditions of protection. The main points set forth may be shortly summarised:—

History.—Before the introduction of trawling, the fisheries of the North Sea were confined, for the most part, to a strip all round the coast. It was manifestly impossible with the ordinary sailing boats, having no provision for preserving the fish, to visit the distant banks. Still we know that the Dogger bank and a few other grounds were regularly visited at certain seasons by Dutch boats, and the luggers proceeding from Yarmouth and other centres on the east coast; and such boats from Staithes and Whitby used to land their catches at the old fish market in Newcastle. The native boats do not appear to have taken part in the deep-sea fishing, and though an attempt was made, I believe, to introduce the larger boats at Cullercoats, it was not successful. The industry at the time specified, as far as our coast was concerned, included three kinds of fishing,—(1) with lines for cod, haddock, ling, plaice, dabs, &c, during the latter months of the year and the first month or two at the beginning of the year; (2) with pots for crabs and lobsters from February and March to July and August; (3) with drift nets for herrings. To these may be added the net fishing for salmon, though it was not at any time, nor is now, characteristic of the whole district.

About 40 years ago trawl net fishing was introduced, as appears from the following note in the President's address to the Tyneside Field Club in 1866. "Mr. Thomas Thompson then exhibited a

specimen of *Nephrops norvegicus*, a species of lobster, which, until the last few years, was unknown on this part of the coast. It is now, however, brought to the Newcastle market in considerable numbers, being taken in the trawl nets, the use of which has only recently been introduced by the fishermen." The replacement of the sailing by steam trawlers, the competition in this method of fishing, and the capital put into the industry, have all aided in bringing about the conspicuous development at North Shields. Unlike the other methods of fishing, continual improvements in the gear have been made. The boats have been built with a view to more extended voyages, and to visit the more distant grounds. The progress at Shields has been great, but it has been greater still at other ports, both in England and Scotland, and trawling centres have within recent years been established at other places as Dundee, Peterhead and Fraserburgh. So that nowadays, instead of practically only the coastal part of the North Sea being fished for a part of the year, the whole of it, or at any rate every available part is fished all the year round. Fish are landed also at North Sea ports which have been caught outside the limits of that wide ocean. We have to keep these considerations in mind in analysing the statistics.

The coast fishermen who are still trying to carry on the methods of fishing pointed out above, have for many years complained that the grounds which used to furnish a good supply of haddocks, cod, plaice, and other white fish, are now practically depleted. Statistics, last year's conferences, and our trawling experiments all tend to confirm these statements. The trawlers themselves admit that, in spite of the improved steam-ships and gear, the nearer grounds are not so productive ; and with regard to plaice at any rate, the whole of the North Sea seems to be suffering from over-fishing. One owner said to me that, some ten or twenty years ago, a boat could get more plaice in a night without going very far out than one could this year, fishing for a whole week, anywhere.

Protection—The Fish.—Protection, then, is necessary. The fish itself tries hard to keep up the species. The important white fishes put into the waters of the North Sea numerous eggs. They are distributed through the waters and hatch out a vast army of fry. These make their way to the banks and towards the shore, and during this period of growth suffer an enormous destruction from their many enemies. In a few years, gaining strength and agility, they become more and more difficult to catch. Their enemies are not so numerous, and they are more able to avoid them, but the larger

continue to prey upon the smaller. They are liable, moreover, to be caught all the year by man, and especially when congregated together for feeding and for spawning. The herring is, at least during its spawning migration, exposed to a great deal of destruction by fish as well as by man; but when it retires after its visit of a few weeks to the shallower waters it manages at all events to avoid being caught by man. It has already, then, a natural protection which the other forms do not enjoy.*

Protection—The Fisherman.—The white fishing being nowadays practically in the hands of the trawler, at least in our district, the duty of the line fisherman is not easy to define in this respect. But the trawl fisherman could do a great deal to keep down waste by avoiding grounds where a great proportion of the fish is small and immature, and by artificially fertilizing the ova from ripe fishes during the spawning season, and returning the fertilised ova to the water. The in-shore fisherman has still in his hands the crab and lobster fishing. This fishing is threatened by the decline in the line fishing forcing more and more men into the pot fishing and for longer periods. It behoves every fisherman, then, to think of the future. He ought not to wait for a bye-law to make him put back the "berried hen." He should do so as a matter of duty, and if he is persuaded that at any season a great destruction of unsaleable crabs takes place, he ought not to fish for crabs during that season.

Protection—The Nation.—The first duty of the nation is the collection of adequate and reliable statistics, that we may learn what fish are caught by the different methods of fishing. The Government has done all that it has the power to do to reserve a portion of the white fishing for the in-shore fishermen, that is, it has given its sanction to every committee desiring to stop trawling within the three-mile limit; and though we now recognise that the three-mile limit is an anomaly so far as affording protection to the spawn and even to the fishes, the Government is of course at present powerless to extend it. The difficulties of regulating the fisheries by Act of Parliament and Bye-law are sufficiently recognised, but it is obviously necessary to protect the fisherman when his interests are threatened by foreign fishermen, and one class of fishermen against another sometimes. Such protection as the law can give would be given all the more readily and effectually if the fisherman would trouble himself by observation, reading, and instruction, to

* The life-histories were given in much fuller detail.

learn as much as he can about the sea and its animals, and especially the life-histories of the fishes, so that he would be prepared when enquiries are instituted to give intelligent reasons for the changes he desires.

Berwick.

The first meeting was held on Tuesday, 25th September, in the Mission Room, The Greens, Berwick. Mr. Barr was chairman. There was only an attendance of 16 men.

After the lecture a discussion took place, or rather a general conversation, on the condition of the fisheries at Berwick. The haddock fishing is worse than ever this year. The following figures I owe once more to Mr. Buglass, the Fishery Officer for the Northern part of the district:—

	Cwt.	Value.
1898	1,546	£1,304
1899	1,437	£1,613

For eight months of 1900 the catch of haddocks is just about one-half of that of 1899—see also last year's Report p. 30. The haddock fishing has suffered an immense reduction during the last few years. The fishermen, after this had been pointed out, said that trawling took place by a great many boats as near the limit as as possible, and some of them believed that a great deal of poaching occurred. It was again stated that the fishing is now all done in-shore, the long lines competing with the small lines for a greatly reduced supply. Among the fish which were specified as having been reduced in numbers was the rock cod, though it used to be common; and the dabs—18 stones of this fish could be got off Burnmouth 20 years ago, but the fishing is not worth prosecuting now.

Crabs were less numerous during last year, likewise, at Berwick.

	Number.
1898	331,149
1899	191,350

I took the opportunity of having a talk with some of the men at Spittal. The success of the herring fishing was of course commented on with much satisfaction, and here as elsewhere the condition of the fishermen, as far as herring fishing and crab and lobster fishing are concerned, was admitted to be no worse than at any time before, but the difficulty is to provide a fishery to replace the white fishing of the latter months of the year. A proposal which I had considered will be referred to later. A good many

mussels were being dredged from the bed of the river, and if the young mussels were gathered regularly from the entrance and put to fatten in or near the bed of the river, the Tweed might be greatly improved in this respect. But as it is nobody's business at present, such a work of the most obvious benefit to the fishing community is neglected. The Spittal men were sure that the line fishing would be greatly encouraged if the mussels were more plentiful. They were agreed also as to the desirability of a close time for crabs from October to December, both inclusive, and the protection of the berried lobster.

Holy Island.—*Wednesday, 26th September.*

The Vicar was chairman over a meeting of about 20 fishermen. After the lecture the men present again referred to the decline in the haddock fishing. Even the codlings which are now got on the rougher grounds, where they are obliged to put the lines, are not numerous. While crabs, they said, were steady, the lobster fishing had decreased.

What the fishermen thought would be most useful to them was large herring boats, which would enable them to follow the herring fishing along the coast. They cost about £500 each. If some arrangement could be made by loans at a low rate of interest, to enable them to buy these boats, the men say it would bring about a great relief to Holy Island. Although they can get plenty of bait, it is little use to them, because the white fishing is so poor.

The development, however, of Fenham flats by the owners into a mussel and oyster farm (see page 63) would provide an excellent local industry. It would be far more likely to be successful than attempting a scheme which would take the men away from the island for long periods.

They complained also again in regard to railway rates. It was said that if, for instance, a cask was sent away weighing 2 cwts. 1 lb. it would be charged as weighing 2½ cwt. They thought that actual weight should be charged, and confirmed the statement in this respect given on p. 28 of last year's Report.

Sea Houses.—*Thursday, September 27th.*

Two or three fishermen only came to the Mission Room along with the Messrs. Ewing, and we had a discussion on fishery matters.

Beadnell.—*Friday, September 28th.*

At Beadnell I had a talk with Mr. Douglas, who still thinks that a close time should be instituted for crabs for October,

November and December, and that during that period the line fishing would pay better. As pointed out last year, the crab fishing requires expensive gear, which has to be replaced by Christmas, and there is a great destruction of crabs during these months. The line fishing, on the other hand, though it would not yield the quantities, would be rendered more valuable because of the enhanced prices. Twelve years ago 50 or 60 stone would have been caught, and sold so as to give 5d. to 6d. clear profit per stone; now, 15 stones should be caught and sold so as to realise 1s. 6d. to 2s. profit per stone, a return about as good as before. If the men could be made to see this for themselves, the crab and lobster fishing at Beadnell and other places would be saved from a dangerous amount of destructive fishing during the months mentioned.

This past season, Mr. Douglas observed that dabs were more numerous, and his statement supports what we have before pointed out from our experimental returns. The crab and lobster fishing was fair in January and February, but poor in the latter part of the season (see his record page 47).

CRASTER.—*Friday, September 28th.*

Mr. T. Archbold presided over a meeting of 40 fishermen. The main difficulty at Craster is, as pointed out in the last report, the harbour. I had it well brought before me, for on the day I arrived in Craster the men were busy hauling the herring boats up. There is no doubt of the necessity for a harbour. Mr. Craster has, I believe, offered to provide half the sum necessary. It was suggested—and it seems a very good plan if the right men were to take it up—to raise the cost by shares to be contributed by the fishermen, who would be recouped by the harbour dues.

They again referred to the anomalies perpetuated by the different conservancies. So that for instance Boulmer, the next village to the south, has a fortnight longer of salmon fishing than Craster.

They complained that the trawlers often came within the limits to fish.

BOULMER.—*Saturday, September 29th.*

My reception here was a unique one. When I got to the Mission Hall there was no one there, but after waiting about 15 minutes after the hour arranged two men came in, a fish merchant and a fisherman, and while getting some information from them several more turned up, bringing the audience up to 10. It was explained that many were waiting at the school, in the expectation that the meeting would be held there, as advertised. I gave a short address.

The line fishing is comparatively successful at Boulmer. Before the three-mile restriction was imposed, the trawlers kept "Coquet Smooth" pretty well clear of fish. It was a favourite ground, and is still, the fishermen allege, greatly poached upon. Now a large quantity of fish can be obtained there, but at a time—February and March—when one would naturally expect the haddocks, &c., to be further out spawning. Up to Christmas there are not many fish on this ground, but after Christmas to the end of February or the begining of March they are as plentiful as ever. The white fishing on the whole, in spite of this, however, has been reduced. With three lines of 1,200 hooks each, 20 to 30 stones could be obtained of cod, haddock, &c., within the ken of some of those present. Now, with the same number of hooks, the catch is 12 to 20 stones.

The crab fishing takes place from the beginning of March until June, as a rule, so that the great destruction of soft crabs complained of elsewhere is avoided here. It is keeping very steady. Lobsters, however, appear to have been more numerous in the past.

Brats (turbot) used to be caught very freely, but they are now much less numerous.

The herring fishing, as in other places, was very successful. There is only one herring boat; but the cobles joined in the fishing on Craster Smooth three to five miles out, and did splendidly.

There are eight or nine cobles at work in the winter. Seven or eight of these were in use at the herring fishing. There are thus some 27 fishermen at Boulmer. Ten years ago there were 13 cobles.

As in other places, the men find that the railway carriage runs away with a large share of the profits. This is increased, of course, by their distance from the railway, the cartage costing 6d. per barrel.

HATCHING EXPERIMENTS AND THE UTILIZATION OF "WASTE OVA."

We have been trying for some years to find out how best to prevent the immense waste of ripe ova which occurs during the spawning season of the common fishes. Recognizing the difficulties attending dealing with it at sea in the trawlers, and obtaining a certain degree of success with isolated experiments made in previous years, we decided this year to put the problem to the test of a large series of experiments with ova and milt obtained from fish brought to North Shields market. The results are given in tabular form.

6th March.

SPECIES.	TIME DEAD (parent fish). MALE.	FEMALE.	RESULT.
1. Haddock ...	4 to 5 days ...	4 to 5 days ...	Failed to fertilize.
1A. ,, ...	,, ...	,, ...	,,
2. ,, ...	1 day ...	,, ...	,,
2A. ,, ...	,, ...	,, ...	,,
3. ,, ...	,, ...	1 day ...	,,
4. Cod ...	4 to 5 days ...	4 to 5 days ...	,,

(At this period (6th March) haddock and plaice were ripe, but cod, on the whole were just getting to the ripe condition. All these fish were preserved in ice).

13th March.

5. Cod ...	3 to 4 days ...	3 to 4 days ...	Failed to fertilize
5A. ,, ...	,, ...	,, ...	,,

(While the trawled haddocks were altogether ripe, an entire batch of coble-caught haddocks were either immature or spawned).

19th March.

6. Cod ...	2 days ...	2 days ...	Failed to fertilize
6A. ,, ...	,, ...	,, ...	,,

19th March.

7, Haddock ...	2 days ...	2 days ...	Failed to fertilize
7A. ,, ...	,, ...	,, ...	,,
7B. ,, ...	,, ...	,, ...	,,

20th March.

8. Plaice ...	1 day or less ...	1 day	Fertilized and developed to to the extent of 30 % of eggs taken. Embryo reached across yolk sac in 9 days.
8A. ,, ...	,, ...	,,	

9 Plaice	...	,,	...	,,

[Sp. gr. 1025 Temp. 39° F.]

A few eggs only developed, an embryo reaching across yolk sac in 9 days. In both cases the embryo then died. Milt not quite so ripe as in "8."

20th March.

10. Cod	...	1 day or less	...	1 day
10A. ,,	...	,,	...	,,

Fertilized. Embryo reached across yolk sac in 7 days, and then died. Very few failed to fertilize out of a large number of eggs.

21st March.

[Sp. gr. 1026 Temp. 40° F.]

11. Haddock	...	12 hours	...	12 hours not quite ripe

Failed to fertilize

12. Plaice	...	6 to 12 hours	...	6 to 12 hours

Only 4 eggs fertilized, and formed embryo reaching across yolk sac in 8 days. Made very slow growth thereafter. In 5 days more the tail only got round to ventral side of yolk sac.

In all these cases (1 to 12), the fish were obtained on the Fish Quay, at North Shields.

The following were obtained from a trawler at Shields, from ripe fish fertilized in a recent state at sea.

23rd March.

13. Haddock ..		living	...	living but not quite ripe

A large number floating, but only 4 fertilized and developed.

13A. ,,	...	..	...	..

[Sp. gr. 1025 Temp. 40° F.]

Only 4 fertilized and developed; rest mostly unripe, and never rose from bottom of box.

26th March.

14. Plaice	...	6 to 12 hours. Milt was found to be dead in many of the males.	...	6 to 12 hours. Still living but naturally only to the extent of making a feeble perhaps involuntary sign of life.

Nine experiments were made with material got at the quay, and only in one in which the spermatozoa were found to be still alive did fertilization and development occur, and that only in a small proportion (some 12) of the ova taken.

27th March.

Mr. Godfrey Hastings was good enough to go out in one of Mr. Hastie's boats, and with the same fish fertilized at successive intervals, brought in material furnishing the following results. The fertilization was done on the 26th March.

15. Haddock...	fresh at 8 p.m. ...	...	...	Embryo formed in 5 days and developed successfully. A number unfertilized.
16. Haddock...	at 10 a.m., 2 hours	...	...	,, ,,
17. ,, ...	at 12 noon, 4 hours	...	...	Failed to fertilize.
18. ,, ...	at 2 p.m., 6 hours (using some fresh milt)	...	...	A number were fertilized.
19. ,, ...	at 4 p.m., 8 hours	...	...	Failed to fertilize.
20. ,, ...	at 6·20 p m., 8 hours	...	...	,,

The fish were kept in a basket and repeatedly stripped as above, the female did not appear to be very ripe.

30th March.

21. Haddock ..	1 hour	...	1 hour	...	Fertilized and developed successfully.
21A. ,, ...	,,	...	,,	...	,, ,,
22. Flounder	1½ hour	...	1½ hour	...	,, ,,
23. Haddock...	½ hour	...	½ hour evidently not ripe	...	Failed to fertilize.

31st March.

24. Plaice ...	"living" Both got on Fish Quay and fertilized "dry," got into boxes 4 hours afterwards.	...	"living"	...	Many successfully hatched out, but a large number though fertilized did not hatch out.
25. Flounder	"living"	...	"living"	...	,, ,,

I examined at 3·30 p.m. milt of plaice got at Shields from living male at 9·30 a.m., and found it quite dead. The milt appears from this and other examinations to be much less resistent than the ova.

The foregoing experiments prove that the ordinary methods of fishing and preserving fish on trawlers are rapidly fatal to the reproductive elements. They tend to show, moreover, that even when the fish are not preserved in ice, the milt and the ova do not long survive the death of the fish. The milt very soon dies after the capture of the fish, but occasionally a specimen is got which retains vitality for some time. This agrees with observations communicated to me by Mr. Cunningham and by Mr. Holt. Without laying any degree of stress on the more purely biological aspect of the experiments, some of the results almost hint that fertilization may be qualitative.

The practical results are at least perfectly clear. They show that, if an attempt is to be made to cope with the effects of overfishing by dealing with the ripe ova of fish when caught, the work must be done at sea with ova and milt as fresh and as ripe as possible. The results which could be got from the exceptional cases of fish recently caught and brought into market in a living condition would be far too small in proportion to the total number to warrant advocating dealing with them in hatcheries. As we have pointed out before, if the fish caught at sea are to be utilized for artificial fertilization, there is no need for bringing them to a hatchery. We believe also that much more work could be accomplished by returning the fertilized ova directly to the water.

In my report for 1898, in reviewing the problem, I was hopeful that if it were proved that the market fish might be utilized in this way the fishermen "would facilitate the work by saving such fish as would be useful for the purpose." And I added—"It would not be necessary, of course, if responsible men were appointed to visit the important fishing grounds during the spawning months, for the purpose of stripping the ripe fish, artificially fertilizing the eggs, and returning the products to the sea."

We thus had the opinion that men should be trained, and sent out during the spawning season to the fishing grounds, there to visit the trawling and other boats, or to be sent out with these boats to fertilize the ova and return it to the sea. Such a scheme, however, would perhaps be too complicated, too expensive, uncontrollable and irksome to fishermen and owners alike.

While the experiments were in progress, we were favoured with a visit from Mr. C. E. Fryer, H.M. Inspector of Fisheries; and the opportunity was taken to bring about a meeting with the North Shields Fish Merchants and Owners of Trawlers, for the purpose of discussing the question. This meeting took place on 27th March. The company met at the Laboratory to see such of the above experiments as were in progress, and immediately afterwards, by the invitation of Mr. Dent, Vice-Chairman of the Northumberland Sea Fisheries Committee, in the Grand Hotel, Tynemouth.

The discussion for the most part was directed to considering how best the work could be carried on at sea. Mr. Fryer pointed out that an effort is being made in Devon to get the fishermen to undertake it for themselves, and strongly advocated that a similar effort should be made here. In the report previously referred to, I stated that I did not anticipate much could be expected from

trawl fishermen. They are kept fairly hard at work at any rate when the fishing is good, and foresight has yet to be engendered in this respect. We concluded, however, that the Technical Education Committee should be asked to select with the aid of the owners, certain of the fishermen, and train them at Cullercoats in the methods, hoping that they would carry out the work at sea, and influence their fellows to follow their example. It seems only right that something like this should be done, and it is to the trawl fishermen we must look to do it, for the in-shore fishermen catch very few ripe fish. That is to say, if we admit that the sea fisheries are suffering from over-fishing, only good can result by an effort on the part of the crew of the vessels principally affected to prevent the present awful waste of ripe ova in the way suggested. If it were made the habit on board these boats, there seems little reason to doubt that the resources of our fishing grounds would be increased and perhaps greatly increased.

The Laboratory, I may be allowed to point out, however, was not designed as a school, and although it may be used, certainly, to train one or two men in the way proposed, I take the opportunity of reminding the committees concerned in its control that the usefulness of the Laboratory could be greatly increased by taking over all the building at present occupied as the baths. At present we suffer rather by not having the water under our control. And with a more extended laboratory, a separate tank room, &c., there would be ample work for the whole time of a fisherman. The "spare time" which we are supposed to get is, we find by experience, too vague to define satisfactorily to both investigator and fisherman.

Since the above was written, Mr. W. Garstang, of Plymouth Laboratory, has kindly sent me a letter explanatory of the experimental effort being made in Devon, and copies of an admirable pamphlet distributed to fishermen for their guidance in carrying out the work of artificial fertilization at sea.

FURTHER OBSERVATIONS ON THE CRAB AND LOBSTER.

I referred in last year's report to the records which two fishermen were making in books provided for the purpoes of their catches of crabs and lobsters. I have now the pleasure of publishing these for the years 1899-1900.

The pots, as is well known, are put down to catch both species, and in the following list under the heading "Number of pots," the total number of pots used by the boat is given. The number in short is the same in the table of the lobsters as it is for the crabs.

Lobsters are as a rule obtained on a rocky bottom, and crabs on both rock and sand. The species, however, are usually not very far apart. It is clear already from the statistics available that the catches of crabs far exceed the catches of lobsters. The Fishery Officers' statistics for crabs and lobsters for the years corresponding to those already given for white fishes (page 14) are as follows:—

CRABS.

	1895.		1896.		1897.		1898.	
	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.
		£		£		£		£
North. District ..	600,438	4,632	1,075,375	6,769	949,323	6,842	1,535,464	9,981
South. District ...	271,695	2,225	361,029	2,602	237,048	2,813	444,974	3,250
North Shields ...	33,920	496	53,780	591	79,240	921	116,860	1,095
Total	906,053	7,353	1,490,184	9,962	1,265,611	10,576	2,097,298	14,326

LOBSTERS.

North. District ...	16,981	639	16,605	741	13,221	849	18,269	885
South. District ...	23,640	1,019	27,727	1,083	38,744	1,338	20,808	794
North Shields	...	...	...	...	..	...	5,098	240
Total . ..	40,621	1,658	44,332	1,824	51,965	2,187	44,175	1,919

From these figures it will be seen, moreover, that the proportion of crabs to lobsters is very different in the Northern and Southern districts. In the Northern district the proportion of lobsters to crabs caught for each year is in rounds numbers, 1 : 40, 1 : 60, 1 : 70, 1 : 80. In the Southern district the proportion for each year is 1 : 11, 1 : 13, 1 : 6, 1 : 21. The latter figures do not show much change, but those for the Northern district seem to indicate that the lobsters are steadily decreasing in numbers. Or that the extension of the ground has put a large number of creels into less favourable situations for catching lobsters. Very likely both views of the case are true.

The crabs are followed during the season out and in and up and down the coast. For the few months of the year utilized by the fishermen who have contributed the following valuable tables, the depths given show the former change of conditions. Each boat may be said to fish on an average some 4—5 miles along the coast.

In Mr. Douglas's tables, the total number of males and females are given irrespective of their being hard or soft, but the number of hard, and therefore retained crabs are shown separately to the right of the table. In 1900 it will be seen that no attempt has been made to separate the males from the females. This is true, likewise, for both years in regard to the lobsters. But Mr. Douglas has added here a column showing the number of small lobsters caught and returned to the water.

Tables Showing an Analysis of the Catches of Crabs and Lobsters for 1899—1900.

TABLE I.—By Mr. J. DOUGLAS, Beadnell.

CRABS—1899.

DATE.	Number of Pots.	Number of Males.	Number of Females.	Total Number.	Number of Hard.	Number of Soft.	Number of Berried Hens.	Depth in Fathoms.
April 1	230	200	150	350	348	2	1	8 to 18
3	,,	275	120	395	392	3	2	,,
4	,,	63	50	113	113	...	1	,,
6	,,	75	65	140	139	1	...	,,
7	,,	40	40	80	78	2	2	,,
8	,,	45	80	125	125	...	...	,,
10	,,	120	120	240	237	3	...	,,
11	,,	160	140	300	298	2	3	,,
12	,,	100	126	226	222	4	...	,,
17	,,	106	135	241	240	1	...	,,
18	,,	260	180	440	438	2	1	,,
19	,,	18	123	141	138	3	2	,,
20	,,	260	150	410	410	...	...	,,
21	,,	57	156	213	212	1	...	,,
22	,,	60	80	140	140	...	...	,,
24	,,	96	246	342	340	2	1	,,
25	,,	28	82	110	110	...	...	,,
26	,,	18	25	43	43	...	...	,,
27	,,	15	28	43	43	...	...	,,
28	,,	60	87	147	147	...	...	,,
29	,,	10	20	30	30	...	...	,,
21 days	...	2066	2203	4269	4243	26	13	...
Average	per day	98	105	203	202	1	0·5	...
May 1	230	40	42	82	82	...	...	8 to 18
2	,,	32	35	67	67	...	1	,,
3	,,	42	40	82	82	...	...	,,
4	,,	12	11	23	23	...	1	,,
5	,,	25	30	55	55	...	...	,,
6	,,	22	18	40	40	...	...	,,
8	,,	7	9	16	16	...	1	,,
9	,,	9	12	21	21	...	1	,,
10	,,	28	31	59	59	...	...	,,
11	,,	30	38	68	68	...	...	,,
12	,,	48	34	82	82	...	1	,,
13	,,	27	32	59	59	...	...	,,
15	,,	39	50	89	89	...	2	,,
16	,,	40	38	78	78	...	...	,,
17	,,	28	32	60	60	...	1	,,
18	,,	24	36	60	60	...	...	,,
19	,,	18	28	46	46	...	...	,,
20	,,	6	8	14	14	...	...	,,
23	,,	38	56	94	94	...	1	,,
25	,,	40	47	87	87	...	...	,,
26	,,	9	15	24	24	...	...	,,
27	,,	14	24	38	38	...	1	,,
29	,,	19	38	57	57	...	...	,,
30	,,	40	28	68	68	...	1	,,
31	,,	26	8	34	34	...	...	,,
25 days	...	663	740	1403	1403	...	11	...
Average	per day	26	30	56	56	...	0·5	...

CRABS.

DATE.	Number of Pots.	Number of Males.	Number of Females	Total Number.	Number of Hard.	Number of Soft.	Number of Berried Hens.	Depth in Fathoms.
June 1	190	24	30	54	54	...	...	4 to 12
2	,,	36	37	73	71	2	1	,,
5	,,	28	30	58	57	1	1	,,
6	,,	7	8	15	15	...	...	,,
7	,,	34	40	74	74	...	...	,,
8	,,	6	7	13	11	2	1	,,
9	,,	46	40	86	86	...	...	,,
10	,,	22	18	40	36	4	2	,,
12	,,	45	36	81	79	2	...	,,
13	,,	10	6	16	16	...	1	,,
14	,,	34	28	62	59	3	...	,,
15	,,	24	18	42	41	1	...	,,
16	,,	20	17	37	37	...	1	,,
17	,,	12	10	22	22	...	...	,,
19	,,	24	18	42	40	2	...	,,
20	,,	11	21	32	29	3	...	,,
21	,,	22	24	46	46	...	...	,,
22	,,	33	40	73	69	4	1	,,
23	,,	28	32	60	60	...	...	,,
24	,,	9	10	19	17	2	...	,,
26	,,	27	27	54	53	1	...	,,
27	,,	7	8	15	15	...	...	,,
28	,,	10	18	28	25	3	...	,,
29	,,	14	12	26	24	2	...	,,
30	,,	34	23	57	55	2	...	,,
25 days	...	567	558	1125	1091	34	8	...
Average	per day	23	22	45	44	1	0·3	...

CRABS—1900.

DATE.	Number of Pots.	Number of Male & Female.	Number of Soft.	Number of Berried Hens	Depth in Fathoms.
April 2	246	300	3	...	10 to 20
3	,,	60	...	1	,,
4	,,	160	2	...	,,
6	,,	500	4	...	,,
7	,,	300	1	...	,,
9	,,	440	...	...	,,
10	,,	180	2	...	,,
11	,,	174	...	1	,,
12	,,	129	1	...	,,
14	,,	63	...	...	,,
16	,,	45	2	...	,,
17	,,	165	1	...	,,
18	,,	170	2	1	,,
19	,,	234	...	...	,,
20	,,	60	...	...	,,
21	,,	180	...	...	,,
23	,,	175	2	...	,,
24	,,	320	1	1	,,
25	,,	125	...	...	,,
26	,,	260	...	...	,,
27	,,	238	1	...	,,
28	,,	220	...	...	,,
22 days	...	4198	22	4	...
Average	per day	204	...	...	...

CRABS.

DATE.	Number of Pots.	Nu'ber of Males and Females.	Number of Soft.	Number of Berried Hens	Depth in Fathoms.
May 1	246	360	...	2	10 to 20
2	,,	243	...	...	,,
3	,,	160	...	1	,,
4	,,	165	...	...	,,
5	,,	163	...	2	,,
7	,,	346	...	1	,,
8	,,	30	...	2	,,
9	,,	45	...	1	,,
11	,,	180	...	1	,,
12	,,	145	...	2	,,
14	,,	120	...	...	,,
15	,,	87	...	2	,,
16	,,	38	...	1	,,
17	,,	55	...	...	,,
18	,,	60	...	2	,,
21	,,	120	...	1	,,
22	,,	60	...	...	,,
23	,,	15	...	1	,,
24	,,	30	...	...	,,
25	,,	34	...	...	,,
26	,,	30	...	...	,,
28	,,	45	...	1	,,
29	,,	6	...	...	,,
30	,,	38	...	...	,,
31	,,	41	...	...	,,
25 days	...	2636	...	20	...
Average	per day	105	...	...	...
June 1	200	40	...	1	10 to 20
2	,,	28	...	...	,,
4	,,	20	...	...	,,
5	,,	15	...	...	,,
6	,,	40	...	1	,,
7	,,	16	...	...	,,
8	,,	45	...	...	,,
9	,,	34	...	...	,,
11	,,	67	...	...	,,
12	,,	22	...	1	,,
13	,,	21	...	...	,,
14	,,	23	...	...	,,
15	,,	8	...	...	,,
16	,,	30	...	...	,,
18	,,	66	...	...	,,
19	,,	20	...	...	,,
20	,,	26	...	1	,,
21	,,	31	...	...	,,
22	,,	30	...	...	,,
23	,,	36	...	...	,,
26	,,	80	...	1	,,
27	,,	30	...	...	,,
28	,,	78	...	...	,,
23 days	...	800	...	5	...
Average	per day	35	...	...	...

LOBSTERS—1899.

DATE.	Number of Pots.	Nu'ber of Males and Females.	Number of Small.	Number of Berried Hens	Depth in Fathoms.
April 1	230	4	1	..	8 to 18
3	,,	5	1	1	,,
4	,,	6	1	4	,,
6	,,	5	...	...	,,
7	,,	1	2	...	,,
8	,,	2	1	...	,,
10	,,	4	...	...	,,
11	,,	5	...	...	,,
12	,,	3	1	...	,,
17	,,	10	3	...	,,
18	,,	19	...	5	,,
19	,,	4	3	3	,,
20	,,	12	...	2	,,
21	,,	8	1	1	,,
22	,,	4	2	...	,,
24	,,	14	...	3	,,
25	,,	29	3	2	,,
26	,,	32	2	1	,,
27	,,	14	1	...	,,
28	,,	29	2	...	,,
29	,,	26	...	...	,,
21 days	...	236	24	22	...
Average	per day	11	...	...	...
May 1	230	7	...	...	6 to 14
2	,,	8	1	1	,,
3	,,	14	...	...	,,
4	,,	10	3	3	,,
5	,,	18	1	3	,,
6	,,	26	...	1	,,
8	,,	21	3	2	,,
9	,,	35	...	6	,,
10	,,	8	2	...	,,
11	,,	26	...	1	,,
12	,,	9	1	...	,,
13	,,	2	...	...	,,
15	,,	10	2	...	,,
16	,,	5	...	3	,,
17	,,	15	1	...	,,
18	,,	12	...	3	,,
19	,,	13	1	2	,,
20	,,	7	...	...	,,
23	,,	3	...	1	,,
25	,,	3	2	...	,,
26	,,	3	...	...	,,
27	,,	5	...	...	,,
29	,,	4	1	1	,,
30	,,	8	...	3	,,
31	,,	7	...	2	,,
25 days	...	279	18	32	...
Average	per day	11	...	...	...

LOBSTERS.

DATE.	Number of Pots.	Nu'ber of Males and Females.	Number of Small.	Number of Berried Hens	Depth in Fathoms.
June 1	190	8	...	..	6 to 14
2	,,	14	1	4	,,
5	,,	8	2	6	,,
6	,,	5	1	3	,,
7	,,	6	...	3	,,
8	,,	11	1	4	,,
9	,,	6	1	1	,,
10	,,	5	2	3	,,
12	,,	4	...	1	,,
13	,,	3	1	3	,,
14	,,	1	...	...	,,
15	,,	11	2	3	,,
16	,,	10	1	2	,,
17	,,	6	...	3	,,
19	,,	7	2	3	,,
20	,,	10	...	4	,,
21	,,	2	1	2	,,
22	,,	1	...	1	,,
23	,,	4	...	2	,,
24	,,	2	...	1	,,
26	,,	4	1	1	,,
27	,,	7	...	2	,,
28	,,	2	...	1	,,
29	,,	1	1	1	,,
30	,,	2	...	2	,,
25 days	...	140	17	56	...
Average	per day	6	...	...	...

LOBSTERS—1900.

April 2	246	3	...	...	6 to 14
3	,,	11	1	1	,,
4	,,	10	1	...	,,
6	,,	13	...	1	,,
7	,,	16	2	1	,,
9	,,	9	...	...	,,
10	,,	12	2	1	,,
11	,,	2	1	...	,,
12	,,	13	...	1	,,
14	,,	13	3	2	,,
16	,,	21	...	2	,,
17	,,	22	...	...	,,
18	,,	19	2	1	,,
19	,,	16	1	1	,,
20	,,	11	2	1	,,
21	,,	16	1	...	,,
23	,,	23	2	2	,,
24	,,	20	1	...	,,
25	,,	21	4	...	,,
26	,,	12	1	...	,,
27	,,	8	...	...	,,
28	,,	7	...	...	,,
22 days	...	298	24	14	...
Average	per day	13·5	...	...	...

LOBSTERS.

DATE.	Number of Pots.	Nu'ber of Males and Females.	Number of Small.	Number of Berried Hens	Depth in Fathoms.
May 1	246	4	...	3	6 to 14
2	,,	16	1	1	,,
3	,,	15	2	2	,,
4	,,	12	1	2	,,
5	,,	16	2	2	,,
7	,,	10	...	1	,,
8	,,	25	2	1	,,
9	,,	6	1	...	,,
11	,,	6	2	1	,,
12	,,	8	1	1	,,
14	,,	6	1	4	,,
15	,,	7	...	1	,,
16	,,	10	2	...	,,
17	,,	7	...	...	,,
18	,,	12	2	1	,,
21	,,	7	1	2	,,
22	,,	14	...	2	,,
23	,,	26	2	5	,,
24	,,	26	...	3	,,
25	,,	20	...	2	,,
26	,,	10	1	1	,,
28	,,	10	...	2	,,
29	,,	11	...	2	,,
30	,,	5	...	...	,,
31	,,	9	...	1	,,
25 days	...	298	21	40	...
Average	per day	12	...	...	...
June 1	200	4	1	1	6 to 14
2	,,	5	2	2	,,
4	,,	6	1	2	,,
5	,,	5	...	2	,,
6	,,	6	1	1	,,
7	,,	15	...	1	,,
8	,,	5	2	2	,,
9	,,	7	1	2	,,
11	,,	1	1	1	,,
12	,,	3	1	...	,,
13	,,	3	...	1	,,
14	,,	4	...	...	,,
15	,,	5	1	2	,,
16	,,	6	...	2	,,
18	,,	5	2	2	,,
19	,,	6	1	1	,,
20	,,	10	...	...	,,
21	,,	6	1	3	,,
22	,,	4	...	...	,,
23	,,	5	...	3	,,
26	,,	3	1	1	,,
27	,,	3	...	2	,,
28	,,	2	...	1	,,
23 days	...	119	16	32	...
Average	per day	5	...	...	...

In the tables given by Mr. Fawcus, it will be noticed that in certain cases—for complete months—the "total number" is that of the males and females, in other cases the "total number" is made up of the "number of hard" and the "number of berried hens." This means that in the former case, the whole of the crabs or lobsters caught were included under "number of males" and "number of females" before the soft crabs were separated, and in the latter, the "total number" refers to the number of hard alone. For April and May, 1899, the "berried hens" were not added in making up the totals.

TABLE II.—By Mr. G. FAWCUS, Sea Houses.

CRABS—1899.

Date.	Number of Pots.	Number of Males.	Number of Females.	Total Number.	Number of Hard.	Number of Soft.	Number of Berried Hens.	Depth in Fathoms.
Apr. 17	128	105	140	245	243	2	1	12
18	128	120	240	360	356	4	...	,,
19	128	80	120	200	200	...	4	,,
20	128	60	90	150	147	3	1	,,
21	128	64	86	150	150	...	...	,,
22	128	40	60	100	98	2	2	,,
24	160	132	232	364	361	3	1	7 to 12
25	160	21	81	102	100	2	...	,,
26	61	31	11	42	40	2	...	7
27	160	50	40	90	90	...	...	7 to 12
28	160	30	74	104	102	2	1	,,
29	93	12	21	33	31	2	1	7
12 days	...	745	1195	1940	1918	22	11	...
Average	per day	62	100	162	160	2	1	...
May 1	128	40	80	120	120	...	...	7 to 12
2	160	50	54	104	104	...	2	,,
3	93	10	4	14	14	...	...	7
4	160	20	20	40	40	...	...	7 to 12
5	124	10	17	27	27	...	...	7
6	124	23	20	43	43	...	...	,,
8	160	12	12	24	24	...	...	7 to 12
9	92	18	12	30	30	...	...	7
10	96	40	20	60	60	...	1	,,
11	96	40	30	70	70	...	...	4 to 7
12	60	20	20	40	40	...	...	4
13	124	80	60	140	140	2	2	4 to 7
15	160	90	100	190	190	...	2	,,
17	160	25	20	45	45	...	...	,,
18	130	16	14	30	30	...	2	,,
19	96	30	20	50	50	...	...	4
20	96	20	10	30	30	...	2	,,
23	32	9	6	15	15	...	1	,,
25	96	40	20	60	60	...	2	4 to 7
26	96	25	15	40	40	...	2	,,
27	96	12	8	20	20	...	1	7
29	96	25	15	40	40	...	1	4 to 7
30	96	18	12	30	30	3	2	,,
31	96	25	17	42	42	1	1	,,
24 days	...	698	606	1304	1304	6	21	...
Average	per day	29	25	54	54	0·25	1	...

CRABS—1899.

Date.	Number of Pots.	Number of Males.	Number of Females.	Total Number.	Number of Hard.	Number of Soft.	Number of Berried Hens.	Depth in Fathoms.
June 1	84	80	40	120	120	...	...	4
2	84	25	15	40	40	...	...	,,
3	84	20	10	30	30	...	...	,,
5	116	35	30	66	65	1	...	,,
6	84	30	25	55	55	...	...	,,
7	116	35	25	60	60	...	...	4 to 7
8	116	30	25	55	55	...	...	,,
9	116	20	20	42	40	2	...	,,
10	116	30	20	50	50	...	...	,,
12	116	20	10	32	30	2	...	,,
13	116	10	9	19	19	...	...	,,
14	116	30	10	42	40	2	...	,,
15	116	30	20	50	50	...	...	,,
16	116	5	5	10	10	...	...	,,
17	116	20	40	62	60	2	...	,,
19	62	25	35	62	60	2	...	4
20	86	11	9	26	20	6	...	4 to 7
21	86	23	11	44	34	10	...	4
22	86	31	10	49	41	7	1	,,
23	86	40	12	63	52	11	...	,,
24	86	26	14	57	40	15	2	,,
26	86	50	30	100	80	20	...	,,
27	86	30	20	66	50	16	...	,,
28	86	40	24	74	64	10	...	,,
29	86	50	30	94	80	14	...	,,
30	86	40	26	78	66	12	...	,,
26 days	...	786	525	1446	1311	132	3	...
Average	per day	30	20	55	50	5	...	...
July 1	86	50	28	98	78	20	...	4
3	86	46	24	86	70	16	...	,,
4	86	55	23	100	78	22	...	,,
5	86	60	40	118	100	18	...	,,
6	86	51	26	98	77	21	...	,,
7	86	48	32	98	80	18	...	,,
8	86	26	16	65	42	23	...	,,
7 days	...	336	189	663	525	138	...	...
Average	per day	48	27	95	75	20	...	...

CRABS—1900.

Mar. 30	64	50	40	90	90	...	...	16
31	64	35	25	60	60	...	...	,,
2 days	...	85	65	150	150	...	...	...
Average	per day	42	33	75	75	...	...	...

CRABS—1900.

Date.	Number of Pots.	Number of Males.	Number of Females.	Total Number.	Number of Hard.	Number of Soft.	Number of Berried Hens.	Depth in Fathoms.
April 2	64	40	60	101	100	1	...	16
4	64	30	30	61	60	...	1	,,
5	64	25	40	65	65	...	...	,,
6	64	60	68	128	128	...	...	,,
7	96	60	50	110	110	...	...	14 to 16
9	96	180	90	272	270	...	2	,,
10	32	15	16	31	31	...	...	14
12	96	100	80	181	180	...	1	14 to 16
14	80	40	50	90	90	...	...	,,
18	96	130	110	240	240	...	...	,,
19	96	50	70	120	120	...	...	,,
20	96	60	50	110	110	...	...	,,
21	96	60	60	121	120	...	1	,,
23	128	130	110	241	240	...	1	7 to 16
24	128	120	134	258	254	4	...	,,
25	128	70	80	150	150	...	...	,,
26	128	134	136	270	270	...	...	,,
27	128	150	211	361	361	...	...	,,
28	128	170	170	340	340	...	...	,,
19 days	...	1624	1615	3250	3239	5	6	...
Average	per day	85	85	171	170	...	...	...
May 1	128	200	203	404	403	...	1	7 to 16
2	32	40	50	92	90	2	...	7
3	32	50	70	122	120	...	2	,,
4	32	40	20	62	60	2	...	,,
5	64	60	80	142	140	...	2	9
7	128	125	115	240	240	...	...	7 to 9
8	128	40	30	70	70	...	...	,,
11	128	104	116	222	220	1	1	,,
12	128	155	196	353	351	...	2	,,
14	128	145	155	302	300	2	...	,,
15	128	80	70	150	150	...	...	,,
16	128	22	23	47	45	2	...	,,
17	128	101	80	182	181	...	1	,,
18	128	40	50	90	90	...	...	,,
19	128	72	84	158	156	...	2	,,
21	128	168	165	333	333	...	...	,,
22	128	35	31	66	66	...	...	,,
23	128	50	74	126	124	2	...	,,
24	128	32	28	62	60	...	2	,,
25	128	38	30	70	68	2	...	,,
26	128	24	26	51	50	...	1	,,
28	128	64	62	126	126	...	...	,,
29	128	60	65	126	125	...	1	,,
30	128	46	54	101	100	...	1	,,
31	128	70	80	152	150	2	...	,,
25 days	...	1861	1957	3819	3818	15	16	...
Average	per day	74	78	154	152	...	...	...

CRABS—1900.

Date.	Number of Pots.	Number of Males.	Number of Females.	Total Number.	Number of Hard.	Number of Soft.	Number of Berried Hens.	Depth in Fathoms.
June 1	128	50	65	115	115	...	...	7 to 9
4	128	40	50	92	90	...	2	,,
6	128	40	35	78	75	2	1	,,
7	128	30	32	64	62	2	...	,,
9	128	45	50	95	95	...	...	,,
5 days	...	205	232	444	437	4	3	...
Average per day		41	46	89	87	...	...	...

LOBSTERS—1899.

Date.	Number of Pots.	Number of Males.	Number of Females.	Total Number.	Number of Berried Hens.	Depth in Fathoms.
Apr. 17	128	2	1	3	...	12
18	128	3	3	6	...	,,
19	128	1	...	1	...	,,
20	128	3	5	8	3	,,
21	128	4	3	7	...	,,
22	128	4	...	4	...	,,
24	160	2	2	4	...	7 to 12
25	160	...	1	1	...	,,
26	61	...	1	1	1	7
27	160	3	3	6	...	7 to 12
28	160	8	2	10	...	,,
29	93	6	2	8	1	7
12 days	...	36	23	59	5	...
Average per day		3	2	5	0·5	...
May 1	128	4	2	6	...	7 to 12
2	160	4	4	8	1	,,
3	93	2	1	3	...	7
4	160	3	1	4	1	7 to 12
5	124	4	4	8	3	7
6	124	7	7	14	3	,,
8	160	6	5	11	2	7 to 12
9	92	5	4	9	2	7
10	96	3	5	8	1	,,
11	96	10	9	19	2	4 to 7
12	62	2	2	4	...	4
13	124	4	2	6	2	4 to 7
15	160	6	6	12	2	,,
17	160	1	2	3	...	,,
18	130	2	...	2	...	,,
19	96	11	12	23	6	4
20	96	7	6	13	2	,,
25	96	1	...	1	...	4 to 7
18 days	...	82	72	154	27	...
Average per day		5	4	9	2	...

LOBSTERS—1899.

Date.	Number of Pots.	Number of Males.	Number of Females.	Total Number.	Number of Berried Hens.	Depth in Fathoms.
June 1	84	4	3	7	2	4
2	84	2	2	4	2	,,
3	84	6	4	10	2	,,
5	116	5	4	9	1	4 to 7
6	84	4	2	6	2	4
7	116	2	3	5	1	4 to 7
8	116	4	4	8	1	,,
9	116	3	2	5	.	,,
10	116	4	3	7	...	,,
14	116	1	1	2	...	,,
15	116	1	...	1	...	,,
16	116	2	1	3	...	,,
17	116	4	8	12	4	,,
19	62	2	2	4	...	4
20	86	1	3	4	...	4 to 7
21	86	2	3	5	2	4
22	86	4	4	8	1	,,
23	86	5	6	11	2	,,
24	86	1	3	4	1	,,
26	86	3	4	7	2	,,
27	86	1	2	3	1	,,
28	86	3	6	9	2	,,
29	86	1	3	4	1	,,
30	86	4	6	10	3	,,
24 days	...	69	79	148	30	...
Average	per day	2·8	3·2	6	1	...
July 1	86	2	4	6	1	4
3	86	4	8	12	2	,,
4	86	1	3	4	1	,,
5	86	2	...	2	...	,,
6	86	3	2	5	1	,,
7	86	2	6	8	2	,,
8	86	1	1	2	...	,,
7 days	...	15	24	39	7	...
Average	per day	2	3	5	1	...

LOBSTERS—1900.

Date.	Number of Pots.	Number of Males.	Number of Females.	Total Number.	Number of Berried Hens.	Depth in Fathoms.
Mar. 31	64	1	...	1	...	16
April 5	64	1	...	1	...	16
7	96	2	...	2	...	14 to 16
9	96	1	...	1	...	,,
12	96	1	2	3	1	,,
14	80	...	1	1	...	,,
18	96	1	...	1	...	,,
19	96	...	1	1	...	,,
20	96	1	...	1	...	,,
21	96	1	...	1	...	,,
23	128	1	...	1	...	7 to 16
24	128	2	1	3	...	,,
25	128	2	4	6	1	,,
26	128	1	3	4	1	,,
27	128	2	1	3	...	,,
28	128	1	1	2	...	,,
16 days	...	18	14	32	3	...
Average	per day	1	1	2	0.2	...
May 1	128	4	4	8	1	7 to 16
4	32	1	2	3	...	7
7	128	1	2	3	...	7 to 9
8	128	4	3	7	2	,,
11	128	5	2	7	2	,,
14	128	2	1	3	...	,,
15	128	4	2	6	1	,,
16	128	1	...	1	...	,,
17	128	2	2	4	...	,,
18	128	2	3	5	2	,,
19	128	1	1	2	..	,,
21	128	...	1	1	...	,,
22	128	1	1	2	1	,,
23	128	2	3	5	1	,,
24	128	2	2	4	...	,,
25	128	1	1	2	...	,,
28	128	2	...	2	...	,,
30	128	...	1	1	...	,,
June 2	128	2	1	3	...	,,
9	128	...	1	1	...	,,
20 days	...	37	33	70	10	...
Average	per day	2	1·5	3·5	0·5	...

In both cases the tables bear out the results pointed out above with reference to the relative abundance of the two species.

Crabs.—The records for the two years show that the catches become gradually reduced during the advance of the season, during the time, that is to say, that the creels are being moved more and more closely in-shore.

On the whole the number caught of each sex is very nearly equal during these months—the males, as a rule, however, being slightly less numerous than the females. This statement agrees with that made by Williamson in summing up the statistics in his recent paper on "Contributions to the Life-History of the Edible Crab." (*Fifteenth Ann. Rep. of Scot. Fish. Bd.*, 1900). But that the proportion of the sexes varies at different seasons has been pointed out by Cunningham (Report of the Cornwall County Council, 1897-8), and by myself in the report of 1898.

It is interesting to note the number of berried-hen crabs caught and returned during these three months each year.

	Beadnell.	Sea Houses.
1899	32	35
1900	29	25

These figures indicate that during this period one berried hen crab is caught for every 150—300 crabs not berried.

In contrast to the crab fishing at the end of the year, the number of soft crabs caught is small. At the end of June, and during July, 1899, Mr. Faweus's table shows that a large increase in the number of soft crabs was taking place. We have already shown that the period necessary for hardening, at least in the case of the mature crab, is one of some 4—5 months, and these numbers therefore foreshadow the nature of the catches which will be made during and for some months after the casting season. I may be able to point out more definitely on another occasion the exact nature of the soft crabs at different seasons. Casting appears to begin in-shore during July and August with the smaller crabs, succeeded immediately by the mature females. The female casters, of course, are at once taken in charge by the males, whose casting is postponed until the migration to deeper water takes place. It occurs, apparently, however, just before the time that the female comes into "berry." The process of hardening in the males then is bound to be a protracted one, occurring as it does during the winter.

As we have pointed out before, the very young crabs cast

many times a year, and the frequency of casting gradually slows down until it becomes annual. The females, however, with the advent of maturity, and the conditions imposed by the hatching of ova are necessarily compelled to make the casting at least biennial. Very likely it is biennial to begin with, but as growth slows down, the period between successive castings becomes more and more extended in both sexes, until it practically ceases altogether. The later castings will in the large sized crabs be of much hygienic importance as well as providing for growth. It rids them of the many and varied animal forms which have become attached to the shell.

I had hoped that I should shortly have been in a position to have put such general statements a little more definitely with the aid of the tank built among the rocks near low water mark at Cullercoats. But the builder has not seemed to realize the strength of the sea which had to be contended against, and we have been interrupted several times by accidents to the lid of the tank. On the last occasion, after the crabs had been under observation from the time some of them came into berry in December and January, until the ova were hatched in August, the lid was so damaged that all the crabs escaped.

Lobsters.—Referring to the table showing the catches made at Sea Houses and Beadnell, there is little to note with regard to the proportion in numbers of the sexes; but the number of berried hens caught and returned is interesting in relation to the Committee's bye-laws.

1899.		Beadnell.	1899.		Sea Houses.
April	...	22	April	...	5
May	...	32	May	...	27
June	...	56	June	...	30
			July	...	7
		110			69

1900.		Beadnell.	1900.		Sea Houses.
April	...	14	April	...	3
May	...	40	May	...	10
June	...	32			
		86			13

The proportion of berried hens to the total number of lobsters caught is for each month :—

	1899.				
Beadnell ...	April 1 : 11	...	May 1 : 9	...	June 1 : 2
Sea Houses	,, 1 : 11	...	,, 1 : 6	...	,, 1 : 5

	1900.				
Beadnell ...	April 1 : 21	...	May 1 : 7	...	June 1 : 4
Sea Houses	,, 1 : 11	...	,, 1 : 7		

The berried hen lobster occurs very frequently in the catches made, especially in June. It is therefore a hardship to return it, and it says all the more for the fishermen who do so not only during the months when it is compulsory, but at all times.

Several lobsters were kept alive in the laboratory tanks during the summer. Two berried hens began hatching at the end of June, and the process continued for over a fortnight. One of these is still alive (November), and has not cast, nor come into berry.

A soft lobster was brought in about the beginning of May, and was found dead on the morning of July 2nd. It was even then soft. This specimen was therefore going to take over two months at least to completely harden, but it is possible that it was abnormal.

ON MUSSEL CULTIVATION ON THE COAST OF NORTHUMBERLAND.

With a view to encouraging line fishing by providing local supplies of mussel bait, we have made further inquiries as to several places on the coast, and started an experiment on the Coquet.

Seaton Sluice was visited on 21st April. The available ground is very limited, and an examination showed that only a few mussels were lodged in the crevices between the stones of the pier in the harbour. The channel is certainly available, but is subject to the local sewage contamination. The larger space above the bridges is left a long time practically uncovered between tides, and would therefore not be very suitable for cultivation. An experiment is being made on the ground between the bridges by a local fisherman with Blyth mussels, and the result of that I shall endeavour to obtain.

As the conditions seemed very favourable on the Coquet above Warkworth harbour, we decided to carefully choose some areas there, with the concurrence of the owners, for experiment. This was accordingly arranged, and with the aid of Ald. Dent, a quantity of Blyth mussels was put down. The mussels made very good progress in a short time, but the results, of course, it would be premature yet to attempt to indicate. We hope to extend the experiment on the Coquet early next year.

In another section (page 36) I have pointed out that a great deal of benefit would accrue to the Spittal and Berwick fishermen by a very simple method of transplanting at the mouth of the Tweed. We wish to try this method of cultivation as well on the Coquet. It is a pity that it could not be made some one's business to do the same at Berwick.

There is no doubt after Mr. Dent's experiments that a similar method of cultivation at Blyth would produce very large beds of bait.

But in all these cases, we suffer from the lack of legal protection. And until something is done in this direction, we shall be working under great difficulties.

Although Mr. King has made very good progress with Mr. Brown's mussel beds at Budle Bay, I think there is room for an immense mussel farm in the neighbouring Fenham flats, Its protected position offers facilities for testing the bouchot system, a system which elsewhere in this country, however, seems to have failed. For one thing it would provide an industry for the Holy Island fishermen. As pointed out last year the edible forms of mollusca could also be cultivated. I am certain that if the owners of the ground should favourably entertain the proposal that any help the Committee or that I could give would be gladly given.

THE MARINE MICROFAUNA AS A SOURCE OF FOOD SUPPLY.

By Prof. G. S. BRADY, F.R.S.

During the past year I have examined numerous collections made by means of surface and deep-nets, from all parts of the district. Though these vary considerably both in the nature and quantity of the captured organisms, the variations appear to depend on causes of which we at present know very little. Often when conditions are, to outward appearance, favourable, the net will draw a blank;—at other times when one expects nothing, a rich haul may result. There can be no doubt, however, that the microfauna of the sea must be a matter of immense importance to fishes. In the Arctic regions where there is a much more abundant minute sea-population, creatures so large as the whales live almost exclusively upon them, and if by any means we could largely increase our local microfauna, we should probably at the same time add greatly to our supply of food-fishes. It is quite certain that the smaller crustaceans constitute a very important part of the food both of marine and fresh water fishes. The species found in the tow-net collections above referred to are as follows. Those occurring almost constantly, often very abundantly, but varying much in relative numbers, are—*Calanus finmarchicus*, Gunner; *Temora longicornis*, Müller; *Acartia longiremis*, Lilljeborg; *Pseudocalanus elongatus*, Boeck; *Centropages hamatus*, Lilljeborg; *Centropages typicus*, Kröyer; *Anomalocera patersonii*, Templeton; *Evadne nordmanni*, Lovén; *Podon polyphemoides*, Leuckart; less commonly and seldom in very great abundance, *Parapontella brevicornis*, Lubbock; *Oithona spinifrons*, Boeck; *Peltidium interruptum*, Goodsir.

An occasional specimen or two may be noted of *Thalestris longimana*, Claus, and other nearly related species, probably stragglers from littoral localities.

But in addition to the adult forms, and probably of quite as

much importance as sources of food supply for fishes, are the larval forms of crabs, worms, barnacles and acorn-shells which often occur in enormous numbers. In still greater quantity, though much more minute are frequently found the two infusorian animals *Ceratium tripos* and *C. fusus*, and the curious little creatures known as arrow worms. The almost constant absence, on our coast, of floating vegetable life is, however, very remarkable when we consider the profuse distribution of the smaller unicellular algæ, not only in the warmer tropical seas, but also even near the poles. Depending, as all animals ultimately must, upon plants for their existence, there can be no doubt that when this minute vegetation exists abundantly, the capacity of the water to support animal life must be greatly increased, and one is ready to think that if we could induce the German Ocean to become a nursery for diatoms, we should do more than all the hatcheries to increase the fish population.

In connection with this subject, it is worth notice that in the neighbourhood of the Tyne and Wear considerable change appears to have taken place of late years in the vegetation of the littoral and laminarian zones—*i.e.* between, and for some distance beyond, tide marks. Thirty to fifty years ago the quantity of "wrack" washed up in these districts after a storm used to be very much greater than now. This must arise from the destruction of the ground on which the marine forests with their attendant animal life used to thrive. Several causes have probably been concerned in the destruction:—first, the extension of piers and harbour-works of various kinds which not only may themselves occupy previously productive areas, but by alteration of currents may silt up or scour them away: secondly, the influx of sewage which renders the water unfit for most kinds of animal and vegetable life, and lastly, the discharge of refuse from steamships and the hoppers of the river commissioners. The fact of the decrease of "wrack" after storms is, at any rate, undoubted, and I think it is equally certain that round the mouths of the Tyne and Wear, as far at least as Whitley on the north and Ryhope on the south, the littoral fauna has become very much impoverished. Many forms of life which, half a century ago used to be common are now to be found only sparsely or not at all. This state of things can scarcely be without an influence on the abundance and well-being of such fishes as, in the earlier periods of their lives, have to seek the waters of the shore.

The effect of sewage contamination has lately shown itself very remarkably in Belfast Lough, where, for a stretch of several miles the shore has become absolutely fetid—so fetid as to be distinctly perceptible in passing along it by rail. This has resulted from the stimulant action of the sewage on the growth of a common green sea-weed (Ulva). The weed has increased in quantity enormously, decomposing banks of it lining the sides of the Lough, and evolving sulphuretted hydrogen and other unwholesome gases. It appears, indeed, that the adjoining country is from this cause becoming to some extent derelict, so far as the well-to-do classes are concerned, well-to-do classes, I mean, not of fishes, but of humanity, for, of the effect upon fishes I have no information.

REPORT ON THE OCCUPATION OF A TABLE

AT THE

CULLERCOATS MARINE LABORATORY.

By F. W. KEEBLE, M.A., and F. W. GAMBLE, D.Sc.

We have been engaged during the greater part of this year (1900) in a research on the colour-physiology of *Macromysis inermis*. This research is a continuation of our former work (*Proceedings of the Royal Society*, 1900. *Q.J.M.S.*, 1900) on the development and significance of colour in Crustacea.

Our subject, *Mysis*, occurred in great abundance off Cullercoats during the late spring and summer, and proved of the utmost value in enabling us to understand the reactions of the so-called chromatophores to light, and other stimuli. Its excellence for this purpose is due to the high transparency of the body, as well as to the limited distribution and orderly arrangement of the chromatophores.

We have succeeded in showing that both quality (colour) of light and light-intensity may act as stimuli to colour change: but that in all probability the former is a factor which does not make itself felt under natural conditions.

Further, the contraction and expansion of the chromatophores, and consequently the colour of the animal are independent—within wide limits—of the intensity and nature of the *incident* light, but are sharply determined by the *quantity* of light reflected from the substratum. The creatures offer a most extraordinary instance of sensitiveness, interpreted in colour-change, to minute changes in the quantity of reflected light. Thus, for example, light admitted into a dark chamber through two or three pin holes is sufficient to bring about a redistribution of pigment if the background be changed from black to white during the experiment.

Beyond these brief indications of the results to which our experiments lead we do not now propose to go, since we wish to extend our observations to other members of the Crustacea, and also to other groups of animals.

We may say, however, that such experiments as these—most of which remain to be done—have practical bearings, since they help in some degree to fill the vast void of our ignorance with respect to the bionomics of the sea.

A popular account of our researches was given by one of us at the Bradford meeting of the British Association. The success of the demonstration, as well as that of our work during the summer, was largely due to Mr. Meek's assistance. We wish to acknowledge the heavy and lasting debt of gratitude which we owe to Mr. Meek for his great kindness during our stay at Cullercoats. Our sincerest thanks are also due to Dr. Brady and to the Committee for their generosity in putting the resources of the laboratory at our disposal.

THE MYSIDÆ OF CULLERCOATS.

By A. MEEK, M.Sc.

The following notes refer for the most part to observations made this year at Cullercoats, but records are also given from other localities on the coast of Northumberland.

Cullercoats harbour may be said to be rich at least in individuals of this family. During the summer a short haul with a bottom net will furnish some 50—100 specimens, young and adult. By far the most common is *Macromysis inermis*: but a fair proportion of *Macromysis flexuosa* and *Siriella armata* is to be found together with smaller numbers of the other species about to be mentioned. *M. flexuosa* of course occurs plentifully in the upper rock pools, and at the upper edge of the harbour.

By "the harbour" is meant the natural channel between the rocks and beyond the piers. Here the boats are moored when the weather permits, but opening as it does, without any shelter, to the sea, the harbour is liable to recurrent and often heavy easterly swells. It only measures about 120 yards across, and its length may be said to be about 250 yards. The rocks on each side are covered by a fathom to two fathoms of water at high tide, and the depth in the harbour at low water is about 5 feet on the average, and at high water some 20—25 feet. A small portion of the bottom next the piers is exposed during spring tides. The bottom consists of sand and mud with rocks and stones bearing laminaria, &c.

The temperature and density are therefore very much like the water outside. The former ranged this summer from 45—47 F. in April, to 56—60 in July and August. The density was very uniform, varying between 1021—1025 as a rule.

Sub-family—Siriellinæ.

Siriella jaltensis, Czerniavsky.

This form was recorded for Cullercoats by Canon Norman (*Fourth Annual Report of Fishery Board of Scotland*, and in his later lists). It is obtained in the harbour fairly constantly, but in small numbers, and both young and adult occur likewise just beyond the rocks, and in the deep water near to them. It was present in a gathering made last year by my late regretted colleague Mr. Saville Shaw among the laminaria, at Cullercoats. It is worthy of note that, while only two or three specimens could be got during the day and not regularly, an evening haul in the dark on 13th September, gave a fairly large number, including a majority of berried females.

Localities: — Cullercoats, St. Mary's Island, Craster, Holy Island.

Siriella armata (Milne Edwards).

Though only occurring sparingly, this species was obtained more constantly—a few specimens appearing usually at every haul.

The usual number of spinules between the terminal spines of the telson is four, but one specimen was observed with only three. The number of the lateral spinules of the telson is very variable. The large distal spine of the inner uroped is commonly bent twice near its extremity.

It was recorded in 1896 for Almouth Bay, an "abdomen" being got in the surface net along with 3 similar fragments of *Macromysis flexuosa*, but the trawling excursions are obviously not likely to furnish examples of the Mysidæ.

Localities:—Cullercoats, St. Mary's Island, Almouth Bay, Holy Island.

Sub-family—Gastrosaccinæ.

Gastrosaccus spinifer (Goës).

One male was obtained off Cullercoats, on 31st May, 1899. And at night, between 8 and 9 o'clock on 13th September this year, one female was caught near the surface, just outside the harbour.

Locality.—Cullercoats.

Sub-family—Leptomysinæ.

Leptomysis lingvura, G. O. Sars.

Canon Norman writing in 1892, says, he took the species "abundantly" between tide marks at Cullercoats, twenty-six years ago. It is got now-a-days, but mostly in the young condition, and is not common. Off Cullercoats in the deeper water, a fair number is obtained in certain places, and a few specimens may be got in

the deeper pools. On the night of the 13th September, this form was fairly abundant in the bottom net, especially in the young condition. I did not get it in the isolated hauls made elsewhere on the coast. The spinulation of the telson is subject to a good deal of variation. The number of spinules intervening between the spines increases with age, and like the spines, each group of spinules increases in size distally.

Locality :—Cullercoats.

Sub-family—Mysinæ.

Hemimysis lamorna (Couch).

Several young specimens evidently referrable to this species were got frequently during the summer in the harbour, though only in small numbers. I briefly described the specimens to Canon Norman, and he replied that they were likely to be this species. The matter was put beyond doubt on the night of the 13th September when an adult male was got in the bottom net. It was fairly common in the catch at Craster (28th September), in the young condition, and two adult males were procured likewise.

Localities :—Cullercoats, Craster.

Macromysis flexuosa (Müller).

This form is, of course, the only Mysid found in the higher pools, but in the lower pools and even in the harbour, it is very common in company with the other species mentioned. *M. neglecta* has not been met with. There was never the least difficulty in separating the *Macromysis* forms into *flexuosa* and *inermis*. Holt and Beaumont* have made a careful analysis of the two species, *M. flexuosa* and *M. neglecta*, from their collections, and their results throw some doubt on the validity of *M. neglecta*. Attention to the characteristic chromatophores would prevent any confusion with such another form as *M. inermis*.

Localities :—Cullercoats, St. Mary's Island, Druridge Bay, Alnmouth Bay, Holy Island (where it is very abundant in the harbour and on Fenham flats). In a trial with a net this year in the Tay at Broughty Ferry, only 2 specimens of this species alone were obtained.

Macromysis inermis (Rathke).

This is by far the commonest species in the harbour. It also occurs in the deeper water just beyond the rocks, and in the lower pools, &c. The following measurements were made from the specimens retained :—

* *Report on the Crustacea Schizopoda of Ireland*, Roy. Dub. Soc. (series II.) vol. VII., part VII., April, 1900.

	Length in mms.																Total
	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Males	...	...	2	8	3	3	1	6	2	7	3	5	1	1	...	...	42
Females ...	10	29	11	16	19	9	4	11	4	4	4	4	1	2	2	...	130
„ Berried	...	...	...	...	...	...	...	...	...	8	8	24	2	9	22	12	85
TotalFemales	10	29	11	16	19	9	4	11	4	12	12	28	3	11	24	12	215

Below 7 mms. I did not find it possible to distinguish by external characters between the sexes. As in other cases higher in the scale, the secondary sexual characters evidently develop most conspicuously with the ripening of the male organs. The characters of the male are for the most part at least positive acquisitions to or modifications of the indifferent type to which the female very nearly approximates.

Localities :—Cullercoats, St. Mary's Island, Craster (where, like Cullercoats, it evidently is abundant).

Schistomysis spiritus, Norman.

One specimen, a female obtained at Cambois Bay on 29th August, 1896, evidently belongs to this species. It answers most closely to Norman's description and Sars' figures.

Schistomysis ornata (G. O. Sars).

A small female most nearly approaching the characters of this species was obtained at Cullercoats, on 1st September, 1900. Occasionally a very small immature mysid was obtained with Schistomysis characters.

Neomysis vulgaris (J. V. Thompson).

About 20—30 young and adult were caught in the Coquet about a mile from the entrance to Amble harbour on 11th October, 1900. Dr. G. S. Brady got it at Almouth in brackish pools in September, 1865.

It will be interesting to add to the list a few notes from the diary of the catches made during the summer relative to the frequency of the Mysids in the harbour at Cullercoats. (One asterisk, occurring; two asterisks, common; three asterisks, very common or abundant).

28th April, 1900 :—

Macromysis inermis, .

,, *flexuosa*, .

Siriella jaltensis, 2.

A varying but usually plentiful collection of *Macromysis inermis* was got during the summer with *M. flexuosa*, usually the two Siriellas in small numbers, *Leptomysis lingvura* and young of *Hemimysis lamornae* along with a few *Hippolyte varians*, an occasional *Pandalus annulicornis*, and other Decapods, &c.

31st July :—*Hippolyte varians*, 1.

Macromysis inermis, young and adult, .

,, *flexuosa*, some 12.

Leptomysis lingvura, 2,

25th July :—*Hippolyte varians*, 2.

Siriella armata, 2.

Macromysis inermis, about 100, of which about 40 were small.

M. flexuosa, 8.

9th Aug.:—*Hippolyte varians*, .

Siriella armata, .

,, *jaltensis*, .

Macromysis inermis, .

,, *flexuosa*, .

with *Crangon vulgaris*, embryo lumpsucker, and young 15-spined stickleback.

10th Aug.:—*Hippolyte varians*, .

Siriella armata, .

Macromysis inermis, .

,, *flexuosa*, .

Leptomysis lingvura, .

with 3 *Crangon vulgaris*.

Sept. 1th:—*Hippolyte varians*, (jv.)

Siriella jaltensis, 1 female berried, and 1 or 2 very young.

Leptomysis lingvura, female jv. 1.

Macromysis flexuosa, female jv. 2.

,, *inermis*, 2 adult female, not berried, and many jv.

Sept. 13th:—between 8 and 9 p.m. in the dark.

Bottom :—*Hippolyte varians*, .

Hemimysis lamorna, adult male, and one young example.

Leptomysis lingvura, *** jv.
Macromysis flexuosa, **.
,, *inermis*, **.

Surface or a fathom from surface :—
Hippolyte varians, jv. 1
Macromysis inermis, jv. **.
Siriella jaltensis, ***, including a majority of "berried" females.
Gastrosaccus spinifer, female 1.

Oct. 23rd :—*Hippolyte, varians*, 1.
Crangon vulgaris, 8.
Macromysis inermis, 1.
,, *flexuosa*, several.

Oct. 30th :—*Hippolyte varians*, **.
Crangon vulgaris, **.
Macromysis flexuosa, *.
,, *inermis*, ***.
Siriella armata, *.
Leptomysis lingvura, **.

Nov. 6th :—*Hippolyte varians*, **.
Crangon vulgaris, **.
Macromysis flexuosa, *.
,, *inermis*, ***.
Leptomysis lingvura, **.

It is thus evident that the characteristic species are still to be got at Cullercoats, as late in the season as November, and abundantly. They get into hiding, however, as a rule when a heavy sea is rolling into the harbour. A few can be got under such conditions—as on October 23rd. But when the weather is fine, as it was on October 30th, they are to be had in abundance.

The following notes refer to the single hauls made at other places.

St. Mary's Island, 26th Sept.: —
Hippolyte varians, ***, including a "berried" female, and many jv.
Siriella jaltensis, *.
,, *armata*, *.
Macromysis inermis, *, including a "berried" female.
,, *flexuosa*, *.

Holy Island Harbour, 26th Sept.:—

Hippolyte varians, , very common.
Pandalus annulicornis, .
Crangon vulgaris, .
Cuma edwardsii, .
Macromysis flexuosa, .
Siriella jaltensis, .
,, *armata*, .

Craster, 28th Sept.:—

Hippolyte varians, .
Pandalus annulicornis, .
Crangon vulgaris, .
Macromysis inermis, , abundant.
Siriella jaltensis, jv.
Hemimysis lamorna, adult male 2, and several jv.

In conclusion, I beg to acknowledge with thanks the help received from Professor G. S. Brady, and the kindness of Canon Norman in sending me his most useful revision of the British Mysidæ (*Ann. and Mag. of Nat. Hist.*, 1892).

THE CUMACEA OF NORTHUMBERLAND.

By A. MEEK, M.Sc.

We have found from time to time a few examples of this remarkable group of Crustaceans, and a list of the species preserved in the laboratory's collections is now given.

Family—Cumidæ.

Cuma edwardsii, Goodsir (as defined by Sars).

This species has been obtained at several places in the northern part of the district as well as at Cullercoats. It was caught in Holy Island harbour, in August, 1897, June, 1898, and again in September this year. In August, 1899, it was got at the surface in Skate Roads. At Cullercoats, it was taken 3—4 miles off on 31st August this year at the Northumberland Coast Club's dredging excursion.

Localities:—Holy Island and Skate Roads, Cullercoats.

Iphinoë trispinosa (Goodsir).

Cullercoats, 31st May, 1899—one male.

Family—Leuconidæ.

Eudorellopsis deformis (Kröyer).

Cullercoats, 31st May, 1899.

Family—Diastylidæ.

Diastylis rostrata (Goodsir).

Several specimens have been obtained off Cullercoats, and even in the harbour.

Diastylis spinosa, Norman.

Females have been obtained at Cullercoats (31st May, 1899, 4th September, 1900), and at Druridge Bay (30th June, 1897).

The specimens agree with Norman's *D. bradyi*, the female of this species, but differ in the following respects:—the blunt teeth on the edge of the carapace are restricted to the anterior portion, with the exception of two which are isolated on the ventral border; the terminal spines of the telson are strong, the 3—4 pairs of lateral spines are weak. The spines on the inner uropod are arranged as follows—3 on the first, 1 on the second, and 1 on the last segment.

Dr. Calman, Dundee, kindly gave me very complete references to the literature bearing on this species, at the same time expressing the opinion based on my description that my specimens were females of *D. spinosa*.

Family—Pseudocumidæ.

Pseudocuma cercaria (v. Beneden).

This form occurs abundantly on the bottom just beyond the rocks at Cullercoats. It gets into the harbour also, and sometimes in pretty large numbers.

Localities.—Druridge, 30th June, 1897, very common.

Cullercoats, 31st May, 1899, 17th July, 1899, several times this year in the harbour, and in the deeper water outside. One female was got at the surface at night on 13th September.

THE

MARINE MOLLUSCA OF NORTHUMBERLAND

(Continued from Last Year's Report).

By G. P. BULMAM.

Among the following additions to my "list" of last year will be seen a number of species for the names, localities, and frequency of which I am indebted to Miss M. V. Lebour.

A few Nudibranchs and Cephalopods are added; but as these lists simply refer to the small collection in the laboratory, they are, of course, not worthy of comparison with those made by Alder and Hancock, particularly with reference to the first named order. There is a great deal to be done yet, and the blank in our collections reminds us forcibly of the splendid work carried out by these authors during the first half of the century. We shall be very thankful for specimens with particulars of localities, &c., of any species not yet recorded.

PELECYPODA.

Family—Arcidæ.

Genus—Arca.

A. tetragona, *Poli.*

A. cardissa, Lam.

"One valve on the beach at Bamboro'."—M.V.L.

Family—Kellidæ.

Genus—Montacuta.

M. bidentata, *Mont.*

"One specimen from shell-sand at Bamboro' in Sept., 1900."—M.V.L.

M. ferruginosa, *Mont.*

"One valve, young, from shell-sand at Bamboro' in Sept., 1900."—M.V.L.

Genus—Lasæa.

L. rubra, *Mont.*

Kellia r., F. and H.

"One specimen from shell-sand at Bamboro'."—M.V.L.

Common on the rocks at Cullercoats.

Family—Cardiidæ.
Genus—Cyamium.

C. minutum, *Fab.*

Tartonia minuta, F. and H.

"Very common, from shell-sand at Bamboro' in Sept, 1900."—M.V.L.

Family—Veneridæ.
Genus—Tapes.

T. virgineus, *Linn.*

Pullastra virginea, Linn.

"One specimen from Bamboro'."—M.V.L.

I have a few small ones from deep water.

T. pullastra, *Mont.*

Pullastra vulgaris, Sow.

"Very common at Cullercoats and Bamboro'."—M.V.L.

Not uncommon, in mud and the laminarian zones of sandy bays.

Family—Tellinidæ.
Genus—Tellina.

T. fabula, *Gron.*

"One specimen at Cullercoats."—M.V.L.

T. pusilla, *Phil.*

T. pygmæa, Lov.

"One specimen in shell-sand from Bamboro' in Sept., 1900."—M.V.L.

Family—Mactridæ.
Genus—Mactra.

M. solida, *Linn.*

"Common on the sands between Beal and Holy Island."—M.V.L.

Not uncommon elsewhere on the coast.

Family—Anatinidæ.
Genus—Thracia.

T. papyracea, *Poli.*

T. phascolina, F. and H.

"Common at Bamboro'."—M.V.L.

Family—Xylophagidæ.
Genus—Xylophaga.

X. dorsalis, *Turt.*

One specimen taken 3 or 4 miles off Cullercoats.

Family—Teredinidæ.

Genus—Teredo.

T. sp. (the "ship-worm.")

Several specimens were got from a piece of pine wood, washed up on Whitley sands in Aug., 1900; but they are so young and so much broken as to make it impossible to determine whether they belong to the species *navalis*, Linn., or *norvegica*, Spengl.

GASTEROPODA.

Family—Fissurellidæ.

Genus—Emarginula.

E. fissura, *Linn.*

"A few specimens from Bamboro' and Cullercoats."—M.V.L.

Rather uncommon. From S. Mary's Island, Whitley.

Family—Littorinidæ.

Genus—Lacuna.

L. crassior, *Mont.*

"One specimen at Bamboro' among coaly sand."—M.V.L.

L. pallidula, *Da Costa.*

"Very common at Bamboro'."—M.V.L.

Genus—Rissoa.

R. costata, *Adams.*

"One specimen (immature) in shell-sand from Bamboro' in Sept., 1900."—M.V.L.

R. inconspicua, *Alder.*

"Not uncommon in shell-sand from Bamboro' in Sept., 1900." —M.V.L.

Genus—Hydrobia.

H. ulvae, *Penn.*

Rissoa u., F. and H.

"Very common in brackish water at Beal."—M.V.L.

I have also obtained one or two specimens from Seaton Sluice in July, 1900.

Family—Velutinidæ.

Genus—Lamellaria.

L. tentaculata, *Mont.*

"One specimen from shell-sand at Bamboro' in Sept., 1900." —M.V.L.

Family—Eolidida.

Genus—Eolis.

E. papillosa, *Linn.*

Common, on the rocks at Cullercoats and Whitley. Also taken in deep water.

Family—Dotonidæ.

Genus—Doto.

D. fragilis, *F. and H.*

Two specimens found among the rocks at Cullercoats in July, 1900.

D. coronata, *Gmel.*

Off Dunstanborough 23rd Sept., 1897.

Family—Dendronotidæ.

Genus—Dendronotus.

D. arborescens, *Müll.*

Very common, in the coralline and deep water zones.

Family—Tritonidæ.

Genus—Tritonia.

T. hombergi, *Cuv.*

Two specimens were obtained on Oct. 12th, 1897, 6 miles off Seaham Harbour.

Family—Polyceridæ.

Genus—Triopa.

T. claviger, *Müll.*

One specimen was taken in the laminarian zone at Cullercoats on Sept. 1st, 1900.

Family—Doridida.

Genus—Doris.

D. tuberculata, *Cuv.*

Very common, on the rocks between tide-marks at Cullercoats and Whitley.

D. pilosa, *Müll.*

From the trawlers at North Shields.

CEPHALOPODA.

Family—Teuthidæ.

Genus—Loligo.

L. vulgaris, *Lam.*

Common, from deep water by trawlers: the gelatinous egg-capsules have also been got.

L. media, *Linn.*

Got occasionally at trawling excursions.

Family—Sepiidæ.

Genus—Sepia.

S. officinalis, *Linn.* (The common "cuttlefish.")

I obtained one specimen washed up on Tynemouth sands in 1898.

Family—Octopidæ.

Genus—Eledone.

E. cirrosa, *Lam.*

E. ventricosa, Grant.

Not common, from the coralline zone.

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